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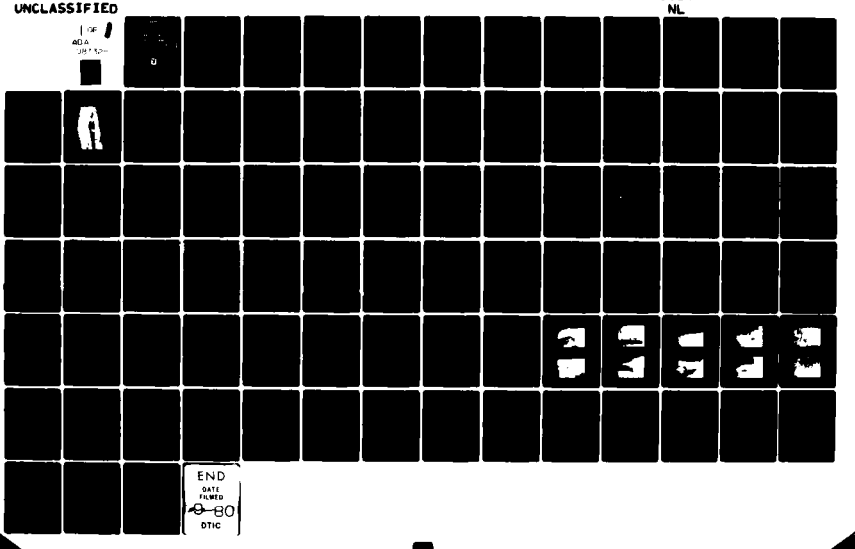

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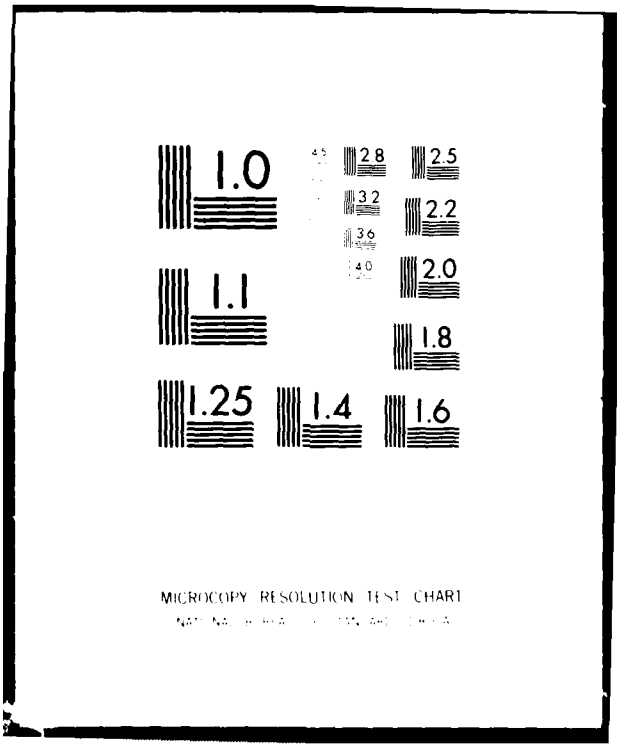
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PASSAIC RIVER BASIN
BRANCH OF WANAQUE RIVER
PASSAIC COUNTY
NEW JERSEY

GREEN TURTLE POND DAM
NJ 00190

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PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED.

DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

FEBRUARY 1980

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REPORT DOCUMENTATION PAGE

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10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS:
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Copies are obtainable from National Technical Information Service, Springfield, Virginia 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

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Visual inspection
Green Turtle Pond Dam, NJ
Seepage
Piezometers
Sediments
National Dam Safety Program

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
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PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO

NAPEN-N

22 JUL 1980

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Green Turtle Pond Dam in Passaic County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Green Turtle Pond Dam, a high hazard potential structure, is judged to be in good overall condition and the spillway is considered adequate. To ensure adequacy of the structure, the following remedial actions, as a minimum, are recommended:

a. The owner should develop an emergency action plan (if one is not already available) outlining actions to be taken by the operator to minimize downstream effects of an emergency and establish a flood warning system for the downstream communities within three months from the date of approval of the report.

b. The following remedial actions should be initiated within twelve months from the date of approval of this report:

(1) Observation wells or piezometers should be installed in the embankment to determine the location of the phreatic surface and the paths of the seepage observed.

(2) The flow of seepage should be monitored monthly to determine its volume and whether it presents a problem to the safety of the dam.

(3) Repair all cracked and spalled concrete in spillway and grouted riprap of downstream channel.

(4) All brush and trees should be removed from the downstream and upstream slopes. The embankment face should then be seeded to develop a growth of grass for surface erosion protection.

(5) Remove all vegetation and debris from the approach and discharge channels.

(6) Remove sediment from the low-level outlet pipe and the outlet stilling basin.

(7) Determine the exact location of the control for the low-level outlet and upgrade it so that the valve can be operated from the embankment crest. The controls should be operated at least once every six months.

(8) Investigate the embankment for animal burrows and fill in any burrow holes with impervious material.

c. Within twenty-four months from the date of approval of this report, the owner should consider providing additional low-level outlet facilities to decrease drawdown time.

d. Within one year from the date of approval of this report, the owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Roe of the Eighth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

NAPEN-N
Honorable Brendan T. Byrne

An important aspect of the Dam Inspection Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

GREEN TURTLE POND DAM (NJ00190)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 16 November 1979 by Harris - ECI Associates, Inc., under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Green Turtle Pond Dam, a high hazard potential structure, is judged to be in good overall condition and the spillway is considered adequate. To ensure adequacy of the structure, the following remedial actions, as a minimum, are recommended:

a. The owner should develop an emergency action plan (if one is not already available) outlining actions to be taken by the operator to minimize downstream effects of an emergency and establish a flood warning system for the downstream communities within three months from the date of approval of the report.

b. The following remedial actions should be initiated within twelve months from the date of approval of this report:

(1) Observation wells or piezometers should be installed in the embankment to determine the location of the phreatic surface and the paths of the seepage observed.

(2) The flow of seepage should be monitored monthly to determine its volume and whether it presents a problem to the safety of the dam.

(3) Repair all cracked and spalled concrete in spillway and grouted riprap of downstream channel.

(4) All brush and trees should be removed from the downstream and upstream slopes. The embankment face should then be seeded to develop a growth of grass for surface erosion protection.

(5) Remove all vegetation and debris from the approach and discharge channels.

(6) Remove sediment from the low-level outlet pipe and the outlet stilling basin.

(7) Determine the exact location of the control for the low-level outlet and upgrade it so that the valve can be operated from the embankment crest. The controls should be operated at least once every six months.

(8) Investigate the embankment for animal burrows and fill in any burrow holes with impervious material.

c. Within twenty-four months from the date of approval of this report, the owner should consider providing additional low-level outlet facilities to decrease drawdown time.

d. Within one year from the date of approval of this report, the owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

APPROVED: James G. Ton

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 19 JAN 1980

PASSAIC RIVER BASIN

BRANCH OF WANAQUE RIVER, PASSAIC COUNTY

NEW JERSEY

GREEN TURTLE POND DAM

NJ00190

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

DEPARTMENT OF THE ARMY

PHILADELPHIA DISTRICT, CORPS OF ENGINEERS

PHILADELPHIA, PENNSYLVANIA 19106

FEBRUARY, 1980

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Green Turtle Pond, I.D. NJ 00190
State Located:	New Jersey
County Located:	Passaic County
Stream:	Branch of Wanaque River
River Basin:	Passaic River
Date of Inspection:	November 16, 1979

Assessment of General Conditions

Green Turtle Pond Dam is an earthfill dam containing a broad crested concrete weir spillway at the right end of the dam. The overall condition of the dam is good. There is no major sign of distress or instability in the embankment. There is a vertical crack in the left abutment. The downstream channel is well defined. The operation of the low-level outlet was not demonstrated since the control for the gate valve could not be located and the owner's representative was not present during the inspection. The hazard potential is rated as "high".

The spillway capacity of Green Turtle Pond Dam is considered adequate in view of the ability of the spillway to pass the SDF without overtopping the dam.

At present, the engineering data available is not sufficient to make a definitive statement on the stability of the dam, but based on the findings of the visual inspection, the preliminary assessment of static stability is that it is satisfactory. The following actions are recommended along with a timetable for their completion. All recommended actions should be conducted under the supervision of an Engineer who is experienced in the design, construction and inspection of dams.

1. Observation wells or piezometers should be installed in the embankment to determine the location of the phreatic surface and the paths of the seepage observed. This should be done within twelve months.

2. The flow of seepage should be monitored monthly to determine its volume and whether it presents a problem to the safety of the dam.

3. Repair all cracked and spalled concrete within twelve months.

4. All brush and trees should be removed from the downstream and upstream slopes to avoid problems which may develop from roots. The embankment face should then be seeded to develop a growth of grass for surface erosion protection. This program should be started within twelve months.

5. Remove all vegetation and debris from the approach and discharge channels within twelve months.

6. Remove sediment from low-level outlet pipe and outlet stilling basin within twelve months.

7. Determine exact location of control for low-level outlet and upgrade it so that the valve can be operated from the embankment crest within twelve months. The controls should be operated at least once every six months.

8. Investigate embankment for animal burrows and fill in any burrow holes with impervious material.

9. The owner should develop an emergency action plan (if one is not already available) outlining actions to be taken by the operator to minimize downstream effects of an emergency and establish a flood warning system for the downstream communities within three months.

Furthermore, while of a less urgent nature, the following additional action is recommended and should be carried out within twenty-four months.

1. Consider providing additional low-level outlet facilities to decrease drawdown time.

2. The owner should develop within one (1) year after formal approval of the report, written operating procedures and a periodic maintenance plan to insure the safety of the dam.

John P. Talerico

John P. Talerico, P.E.
Harris-ECI Associates

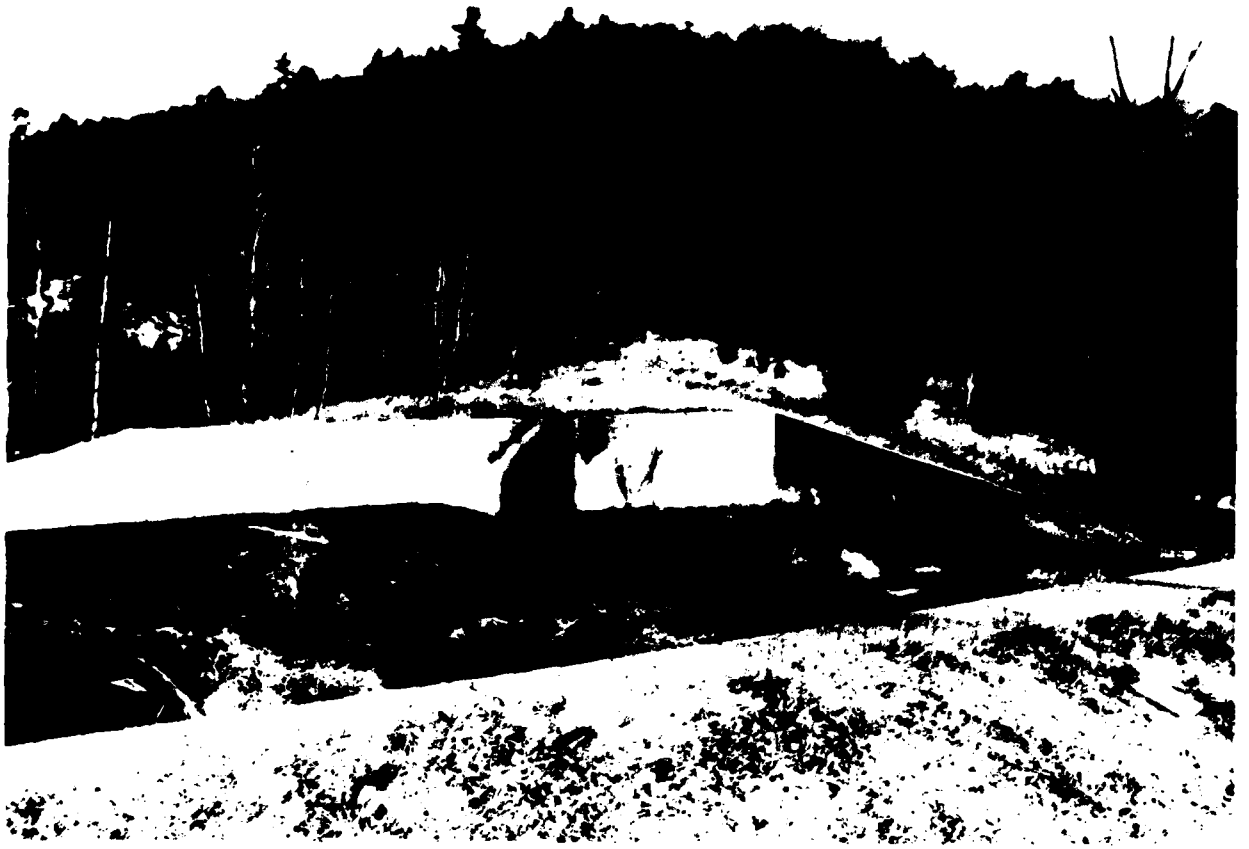

Photo taken on January 21, 1980

G R E E N T U R T L E P O N D D A M

View looking toward left abutment wall of spillway and embankment beyond wall.

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

GREEN TURTLE POND DAM, I.D. NJ 00190

S E C T I O N 1

1. PROJECT INFORMATION

1.1 General

a. Authority

The National Dam Inspection Act (Public Law 92-367, 1972) provides for the National Inventory and Inspection Program by the U.S. Army Corps of Engineers. This inspection was made in accordance with this authority under Contract C-FPM No. 35 with the State of New Jersey who, in turn, is contracted to the Philadelphia District of the Corps of Engineers, and was carried out by the engineering firm of Harris-ECI Associates, Woodbridge, New Jersey.

b. Purpose of Inspection

The visual inspection of Green Turtle Pond Dam was made on November 16, 1979. The purpose of the inspection was to make a general assessment as to the structural integrity and operational adequacy of the dam embankment and its appurtenant structures.

c. Scope of Report

The report summarizes available pertinent data relating to the project; presents a summary of visual observations made during the field inspection; presents an evaluation of hydrologic and hydraulic conditions at the site; presents an evaluation as to the stuctural adequacy of the various project features; and assesses the general condition of the dam with respect to safety.

1.2 Description of Project

a. Description of Dam and Appurtenances

Green Turtle Pond Dam is an earthfill dam approximately 305-ft. long and 35-ft. high with a compacted clay fill core wall. There is a 30-ft. wide broad crested concrete weir spillway at the right end of the dam. The crest of the spillway is 4.0 ft. below the top of the dam. The embankment crest has a

width of 20 feet with an upstream slope of 5H:IV and a downstream slope of 4H:IV. Riprap protection has been placed on the upstream face of the embankment.

The low-level outlet consists of a 18-inch cast iron pipe through the dam approximately 400 feet left of the spillway. The flow through the pipe is controlled by a manually operated gate valve located in the upstream side of the embankment. The inlet end of the pipe is located at the upstream toe of the slope. The outlet discharges into a stilling pool at the end of the spillway channel. From the pool the flow continues in a southerly direction approximately 750 feet to a 6-foot diameter R.C.P. passing under Awosting Road.

There are no records of any borings and/or test pits taken for this dam.

A generalized description of soil conditions is contained in Report No. 3, Passaic County, Engineering Soil Survey of New Jersey, by Rutgers University. The report describes the dam site as Gneiss bedrock, erratically covered with a variable but thin, mantle of unconsolidated glacial materials. The bedrock is further described by Geologic Overlay Sheet 23 as Hornblende Granite and Gneiss.

b. Location

Green Turtle Pond Dam is located on a branch of the Wanaque River in the Township of West Milford, Passaic County, New Jersey. It is accessible by way of Awosting Road.

c. Size Classification

According to the "Recommended Guidelines for Safety Inspection of Dams" by the U.S. Department of the Army, Office of the Chief of Engineers, the dam is classified in the dam size category as being "small", since its storage volume of 368 acre-feet is less than 1,000 acre-feet. The dam is also classified as small because its height of 35 feet is less than 40 feet. The overall size classification of Green Turtle Pond Dam is small.

d. Hazard Classification

A hazard potential classification of "high" has been assigned to the dam on the basis that a hypothetical failure would result in excessive damage to road immediately downstream of the dam, because the road is heavily traveled and there are several habitable buildings immediately downstream. The possibility exists of the loss of more than a few lives in the event of dam failure.

e. Ownership

Green Turtle Pond Dam is owned by:

State of N.J. Green Acres
Department of Conservation
Trenton, NJ 08625

Attention: Mr. Curt Eubert
Director, Green Acres

f. Purpose

Green Turtle Pond Dam is presently used for recreational purposes only.

g. Design and Construction History

A permit to construct Green Turtle Pond Dam was issued in 1957 and construction was completed in 1958. A summary of the construction history, from initial application to final acceptance of the dam, is available on microfilm at the N.J. Department of Environmental Protection.

h. Normal Operating Procedures

The discharge from the lake is unregulated and is allowed to naturally balance the inflow into the lake. The low-level outlet is used to lower the lake level by a manually operated gate valve which could not be located at the time of the inspection. Also, the owner's representative was not present to operate the valve at the time of the inspection.

1.3 Pertinent Data

a. Drainage Area	0.5 sq. mi.
b. Discharge at Dam Site	
Ungated spillway capacity at elevation of top of dam:	744 cfs (elev. 580, NGVD)
Total spillway capacity at maximum pool elevation (SDF):	679 cfs (elev. 579.76 NGVD)
c. Elevation (Feet above NGVD)	
Top of dam:	580
Maximum pool design surcharge (SDF):	579.76
Recreation pool:	576.3
Spillway crest:	576.0
Streambed at centerline of dam:	545 (estimated)
Maximum tailwater:	546.5 (estimated)
d. Reservoir	
Length of maximum pool:	2,500 ft. (estimated)
Length of recreation pool:	2,400 ft. (estimated)
e. Storage (acre-feet)	
Spillway crest:	251
Top of dam:	386
Maximum pool (SDF):	368
f. Reservoir Surface (acres)	
Top of dam:	39
Maximum pool (SDF)	33 (estimated)
Recreation pool:	N/A
Spillway crest:	28 (estimated)

g. Dam

Type:	Earth fill with broad crest weir
Length:	305 ft. (effective)
Height:	35 ft.
Top width:	20 ft.
Side slopes - Upstream:	5H:1V
- Downstream:	4H:1V
Zoning:	Unknown
Impervious core:	Clay core, 580-ft. long
Cutoff:	None
Grout curtain:	None

h. Diversion and Regulating Tunnel

N/A.

i. Spillway

Type:	Broad crest weir with notch at center
Length of weir:	30 ft.
Crest elevation:	576
Gates:	None
U/S Channel:	Green Turtle Pond
D/S Channel:	Side channel discharge to Natural channel

j. Regulating Outlets

Low level outlet:	18-inch C.I.P.
Controls:	Manually operated outlet gate
Emergency gate:	None
Outlet:	546 (NVGD) estimated

SECTION 2

2. ENGINEERING DATA

2.1 Design

Drawings for the original construction of Green Turtle Pond Dam in 1957 are on microfilm and are available at the Trenton offices of the N.J. Department of Environmental Protection (NJ-DEP). In addition, a gradation analysis of the soil used to build the dam are on file at the NJ-DEP. Also, recommendations for soil borings and/or test pits are available, but there is no record of the logs.

2.2 Construction

Data is not available concerning the as-built construction of the dam. Some data exists on the proposed construction methods, borrow sources, and other data pertinent to the construction of the dam at the NJ-DEP.

2.3 Operation

Formal operation records are not kept for the dam and reservoir. The lake is allowed to operate naturally without regulation.

2.4 Evaluation

a. Availability

The availability of engineering data is good. The stated drawings, computations and some correspondence concerning the construction are available from the NJ-DEP.

b. Adequacy

The engineering data available, together with that obtained in the field, were adequate to perform hydrologic and hydraulic computations. The data was insufficient to perform a stability analysis, but preliminary evaluation could be made based on visual observations.

c. Validity

Information contained in the drawings and checked by limited field measurments appears to be valid.

SECTION 3

3. VISUAL INSPECTION

3.1 Findings

a. General

The visual inspection of Green Turtle Pond Dam revealed the dam and spillway to be in good condition, but in need of minor repairs and maintenance. The lake level was above the crest of the spillway at the time of the inspection.

b. Dam

The earth embankment appears to be sound. No surface cracking on the embankment or at the toe was noted. No erosion of the embankment was observed. No misalignment of the embankment in the horizontal or vertical plane was evident. Numerous trees, small to large size are growing on both embankment sides. A few trees were uprooted leaving small cavities on the downstream slope. Minor seepage was occurring at two locations. One seepage location was 5 feet right of the low-level outlet drain and the other was approximately 100 feet downstream of the spillway, 5 feet left of the channel. No evidence of burrowing by animals was discovered; however, at the time of the inspection, the embankment was covered with leaves, therefore the possibility does exist that there may be burrow holes in the embankment.

c. Appurtenant Structures

1. Spillways

A concrete spillway exists on the right side of the embankment. The spillway is in good condition and is notched (3'-6" wide x 3" high) at the center. No seepage or leakage was noticed at the spillway. Minor spalling and two very small surface cracks were observed at the right abutment of the spillway. A vertical crack extends from the top of the left abutment to the apron at the spillway. Horizontal and vertical alignment of the crest are good. A long concrete apron serves as the approach channel. Fallen trees, vegetation and silt clutter this approach channel.

2. Outlet Works

An 18-inch diameter cast iron pipe was observed exiting at the downstream side of the embankment at the channel pool. This low level outlet pipe was three-quarters full of sediment. The surface of the stilling basin was covered with sediment. No low level outlet control was found on the upstream side of embankment as shown on the embankment plans or in the vicinity of the embankment.

d. Reservoir Area

Earth slopes and rock outcropping encompass the reservoir. The earth slopes are moderate and stable while the rock slopes are steep and firm. There are no structures situated on the reservoir rim.

e. Downstream Channel

The bottom of the downstream channel is grouted riprap and is in good condition. There are some cracks in the grout. Some vegetation, fallen trees and debris are in the channel. The channel flow runs into a pool that is located approximately 230 feet from the spillway. From the pool, the flow continues through a 6-foot diameter reinforced concrete pipe under Awosting Road, which is located approximately 1,000 feet from the spillway. The discharge then passes under Greenwood Lake Turnpike, which is located approximately 250 feet downstream from Awosting Road.

SECTION 4

4. OPERATIONAL PROCEDURES

4.1 Procedures

Green Turtle Pond Dam is used to impound water for recreational activities. The level of the lake is maintained through the unregulated flow over the spillway and the lake is not lowered on a regular basis.

4.2 Maintenance of the Dam

There is no regular inspection and maintenance program for the dam and appurtenant structures. The State of New Jersey Green Acres, Department of Conservation is responsible for the maintenance of the dam.

4.3 Maintenance of Operating Facilities

The low-level operating facilities consist of the one manually operated 18 inch gate valve. At the time of inspection, operation of the valve was not demonstrated because the gate valve could not be found and the owner's representative was not present.

4.4 Evaluation

The present operational and maintenance procedures are fair with the dam and spillway being maintained in a serviceable condition.

SECTION 5

5. HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design

The drainage area above Green Turtle Pond Dam is approximately 0.50 square miles. A drainage map of the water shed of the dam site is presented on Plate 1, Appendix D.

The topography within the basin is flat. Elevations range from approximately 840 feet above NGVD at the North end of the watershed to about 580 feet at the dam site. Land use patterns within the watershed are mostly woodland with concentrated residential development around the lake area.

The evaluation of the hydraulic and hydrologic features of the dam and lake was based on criteria set forth in the Corps Guidelines and additional guidance provided by the Philadelphia District, Corps of Engineers. The Spillway Design Flood (SDF) for the dam is equal to the 1/2 PMF.

The Probable Maximum Flood (PMF) was calculated from the probable maximum precipitation using Hydrometeorological Report No. 33 with standard reduction factors. Due to the small drainage area, the SCS triangular hydrograph transformed to a curvilinear hydrograph was adopted for developing the unit hydrograph, with the aid of the HEC-1-DM Flood Hydrograph Computer Program.

Initial and infiltration loss rates, were applied to the Probable Maximum Precipitation to obtain rainfall excesses. The rainfall excesses were applied to the unit hydrograph to obtain the PMF and various ratios of PMF utilizing program HEC-1-DB.

The SDF outflow calculated for the dam is 679 cfs. This value is derived from half PMF, assuming that the lake was originally at the spillway crest elevation. The half PMF was routed through the dam and it was found the dam would not overtop. There would be approximately half foot of freeboard remaining. Based on the routing, it can be concluded that Green Turtle Pond Dam is adequate.

The stage-outflow relation for the spillway was determined from the geometry of the spillway and dam, utilizing HEC-1-DB program.

The reservoir stage-storage capacity relationship was computed directly by the conic method, utilizing the HEC-1-DB program. The reservoir surface areas at various elevations were measured by planimeter from USGS Quadrangle topographic map. Reservoir storage capacity included surcharge levels exceeding the top of the dam

and the spillway rating curve was based on the assumption that the dam remains intact during routing.

Breach analysis is not required since the spillway capacity is adequate.

Drawdown calculations indicate that to empty the lake to an elevation of 552 NGVD through the one low-level sluice would take 4 days, excluding inflow. This is considered to be an excessive drawdown period, and provision of additional outlets should be considered.

b. Experience Data

No records of reservoir stage or spillway discharge are maintained for this site.

c. Visual Observation

The downstream channel is well defined. Grouted riprap is on the bottom. The slopes of the channel are shallow to moderate. There are three houses on the left bank of the downstream channel, beyond Greenwood Lake Turnpike, located approximately 1,300 feet from the spillway.

Earth slopes and rock outcropping encircle the reservoir. The earth slopes are moderate and stable while the rock slopes are steep and firm. The drainage area is wooded and moderately flat sloped.

d. Overtopping Potential

As indicated in Section 5.1.a, the spillway capacity of Green Turtle Pond Dam is considered adequate to pass the SDF with no overtopping potential.

SECTION 6

6. STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

There are no major signs of distress in the embankment of the Green Turtle Pond Dam. Trees growing on both embankment sides could pose a threat to stability. A few small cavities created by uprooted trees were observed. Seepage was occurring at two locations. One seepage location was 5 feet right of the low level outlet and the other was about 100 feet downstream of the spillway, 5 feet left of the channel. The seepage has not been monitored and no information was uncovered concerning their duration or flow rates. No evidence of burrowing animals was observed; however, the embankment was covered with leaves and therefore the possibility does exist that there may be burrow holes in the embankment. The spillway is in good condition but does show minor spalling, and cracking.

b. Design and Construction Data

No design computations relating to stability were uncovered during the report preparation phase. No embankment or foundation soil parameters are available for carrying out a conventional stability analysis on the embankment. No construction data or specifications relating to the degree of embankment compaction are available for use in the stability analysis.

c. Operating Records

No operating records are available relating to the stability of the dam. The dam and spillway have served satisfactorily since its construction in 1958.

d. Post-Construction Changes

None on record.

e. Static Stability

A static stability analysis was not performed for Green Turtle Pond Dam because the lack of data on which to base assumptions of material properties and embankment cross-sections might produce misleading results, but based on the findings of the visual inspection, the preliminary assessment of static stability is that it is satisfactory.

f. Seismic Stability

Green Turtle Pond Dam is located in Seismic Zone 1, as defined in Recommended Guidelines for Safety Inspection of Dams, prepared by the Corps of Engineers. In general, projects located in Seismic Zones 0, 1 and 2 may be assumed to present no hazard from earthquake, provided the static stability condition are satisfactory and conventional safety margins exist. Since static stability safety factors have not been confirmed, it cannot be stated that seismic stability is satisfactory.

S E C T I O N 7

7. ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment

a. Safety

The dam has been inspected visually and a review has been made of the available engineering data. This assessment is subject to the limitations inherent in the visual inspection procedures stipulated by the Corps of Engineers for a Phase I report.

The adequacy of Green Turtle Pond Dam is not in question because the dam does have adequate spillway capacity to pass half of the PMF, which is the SDF for the dam, without overtopping.

No definitive statement pertaining to the safety of the embankment can be made without acquisition of embankment material engineering properties, but based on the findings of the visual inspection, the preliminary assessment of static stability is that it is satisfactory.

b. Adequacy of Information

The information uncovered was adequate to perform hydrologic and hydraulic computations. The data was insufficient to perform even an approximate computation of the stability of the dam. A preliminary assessment of the dam could be made by visual observation only.

c. Urgency

Observation wells or piezometers should be installed in the embankment to determine the location of the phreatic surface and the paths of the seepage observed. This should be done within twelve months.

The flow of seepage should be monitored monthly to determine its volume and whether it presents a problem to the safety of the dam.

The existing dam plans and drawings should be annotated and updated to form a coherent as-built set within twelve months.

7.2 Remedial Measures

a. Alternatives for Increasing Spillway Capacity

1. Alternatives for increasing spillway capacity are not necessary as it is adequate to handle the SDF.

b. Recommendations

1. Repair all cracked and spalled concrete within twelve months.

2. All brush and trees should be removed from the downstream and upstream slopes to avoid problems which may develop from roots. The embankment face should then be seeded to develop a growth of grass for surface erosion protection. This program should be started within twelve months.

3. Remove all vegetation and debris from the approach and discharge channels within twelve months.

4. Remove sediment from low level outlet pipe and outlet stilling basin within twelve months.

5. Determine exact location of controls for low level outlet and upgrade it so that the valve can be operated from the embankment crest, within twelve months. The controls should be operated at least once every six months.

6. Investigate embankment for animal burrows and fill in any burrow holes with impervious material.

The following additional actions are recommended:

1. The owner should develop an emergency action plan (if one is not already available) outlining actions to be taken by the operator to minimize downstream effects of an emergency and establish a flood warning system for the downstream communities within three months.

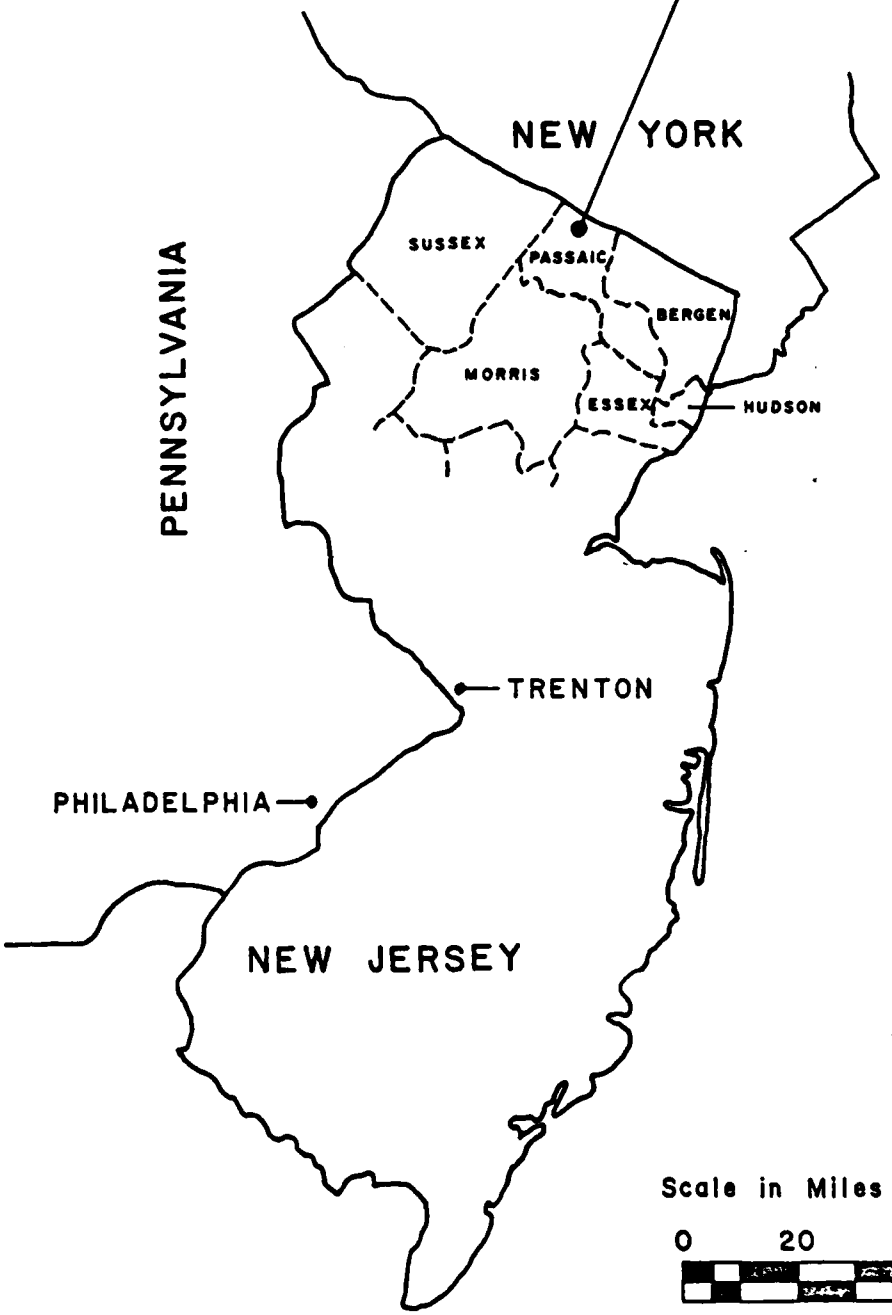
2. Consider providing additional low level outlet facilities to decrease the drawdown time.

c. O & M Procedures

The owner should develop, within one (1) year after formal approval of the report, written operating procedures and a periodic maintenance plan to insure the safety of the dam.

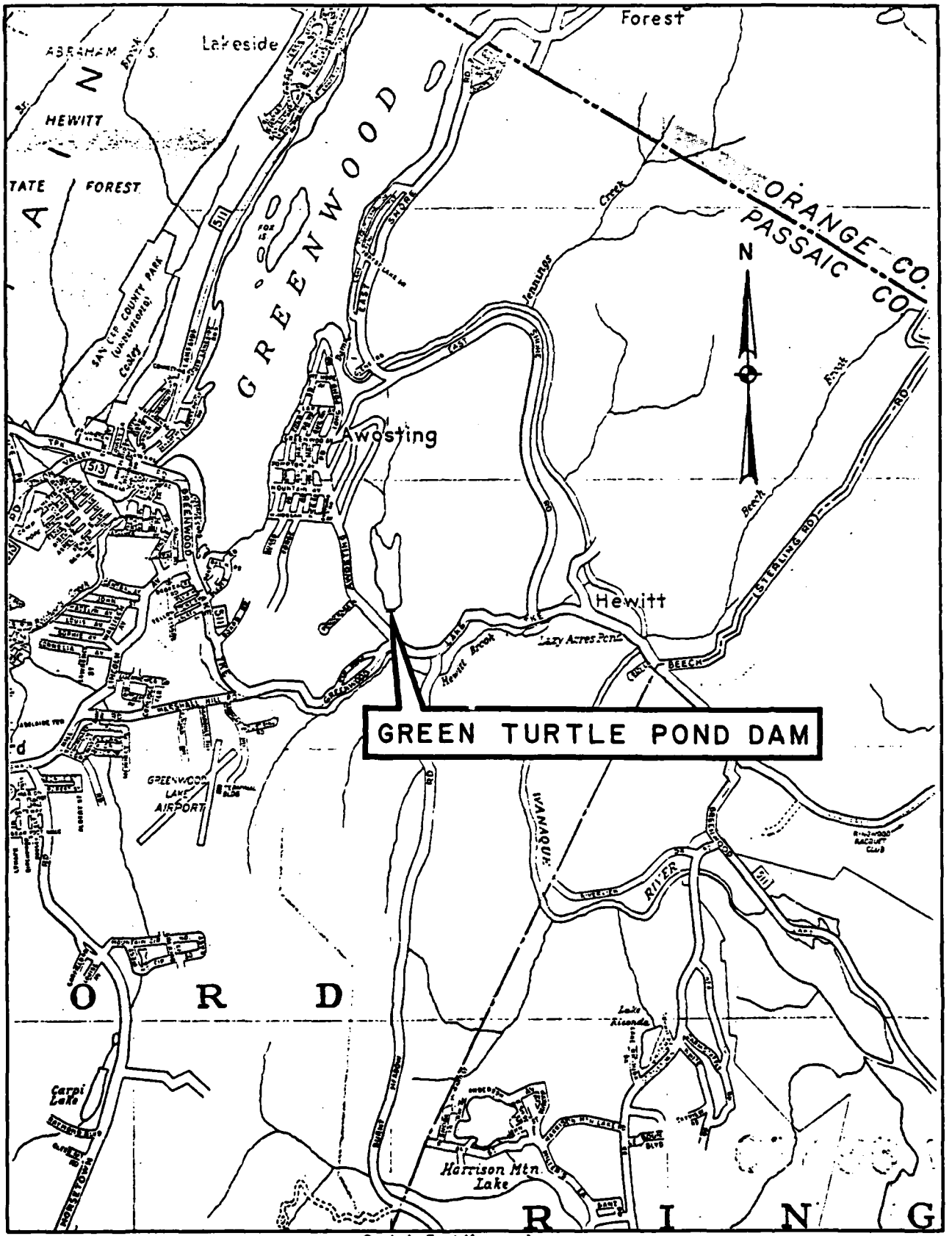
PLATES

GREEN TURTLE POND DAM
WEST MILFORD TWP.
PASSAIC COUNTY, N. J.



KEY MAP

PLATE 1

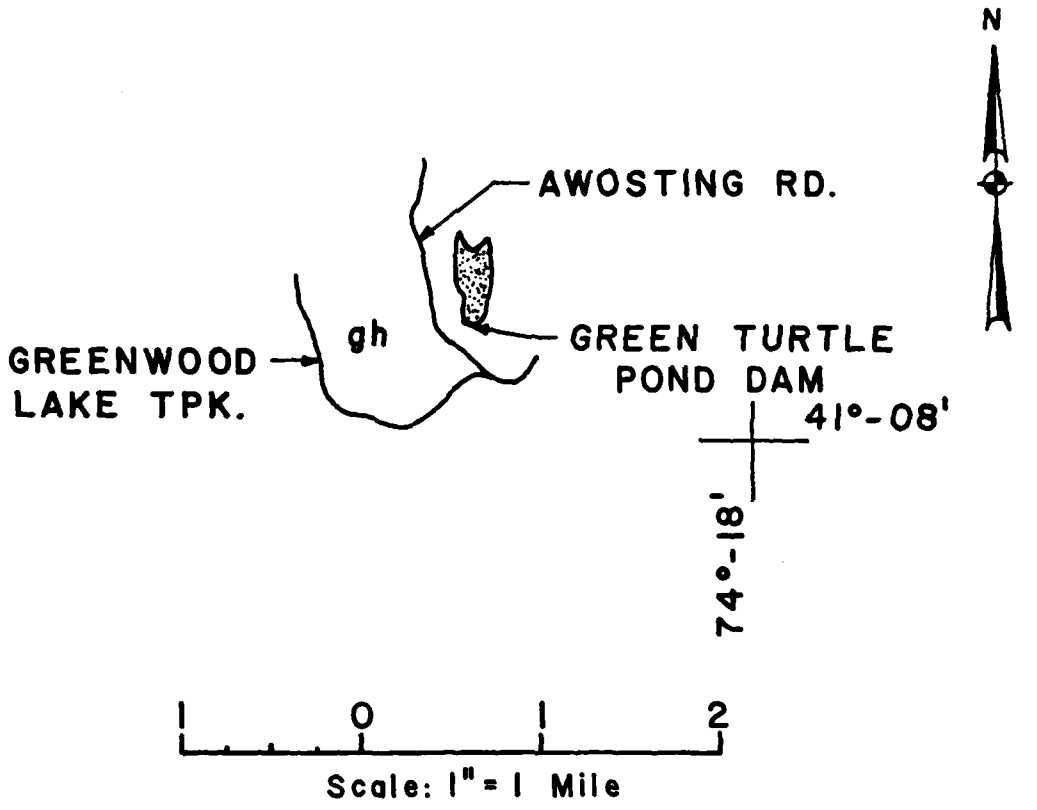


Scale in Feet (Approx.)

2,000 0 2,000 4,000 6,000 8,000 10,000

VICINITY MAP

PLATE IA



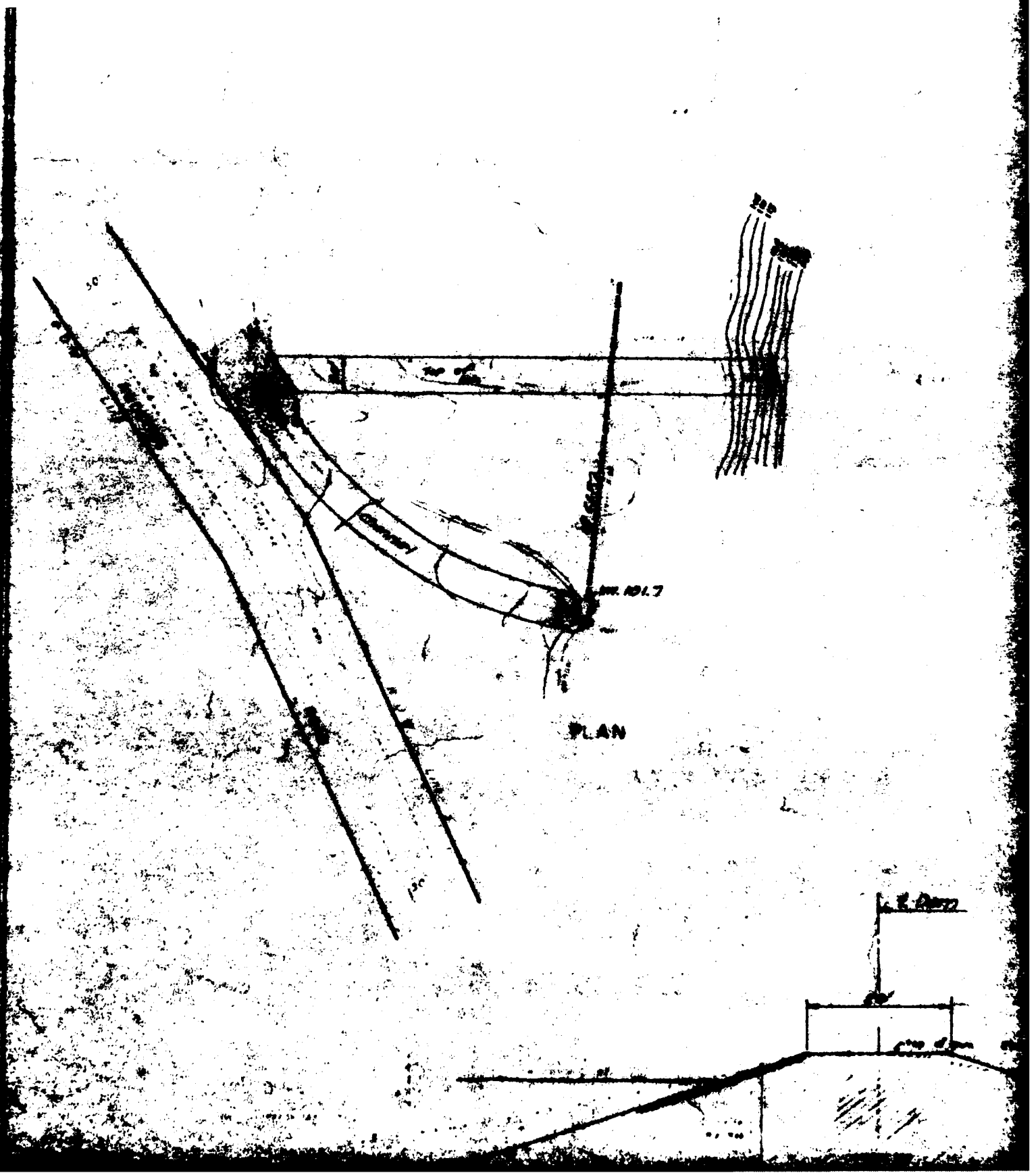
LEGEND:

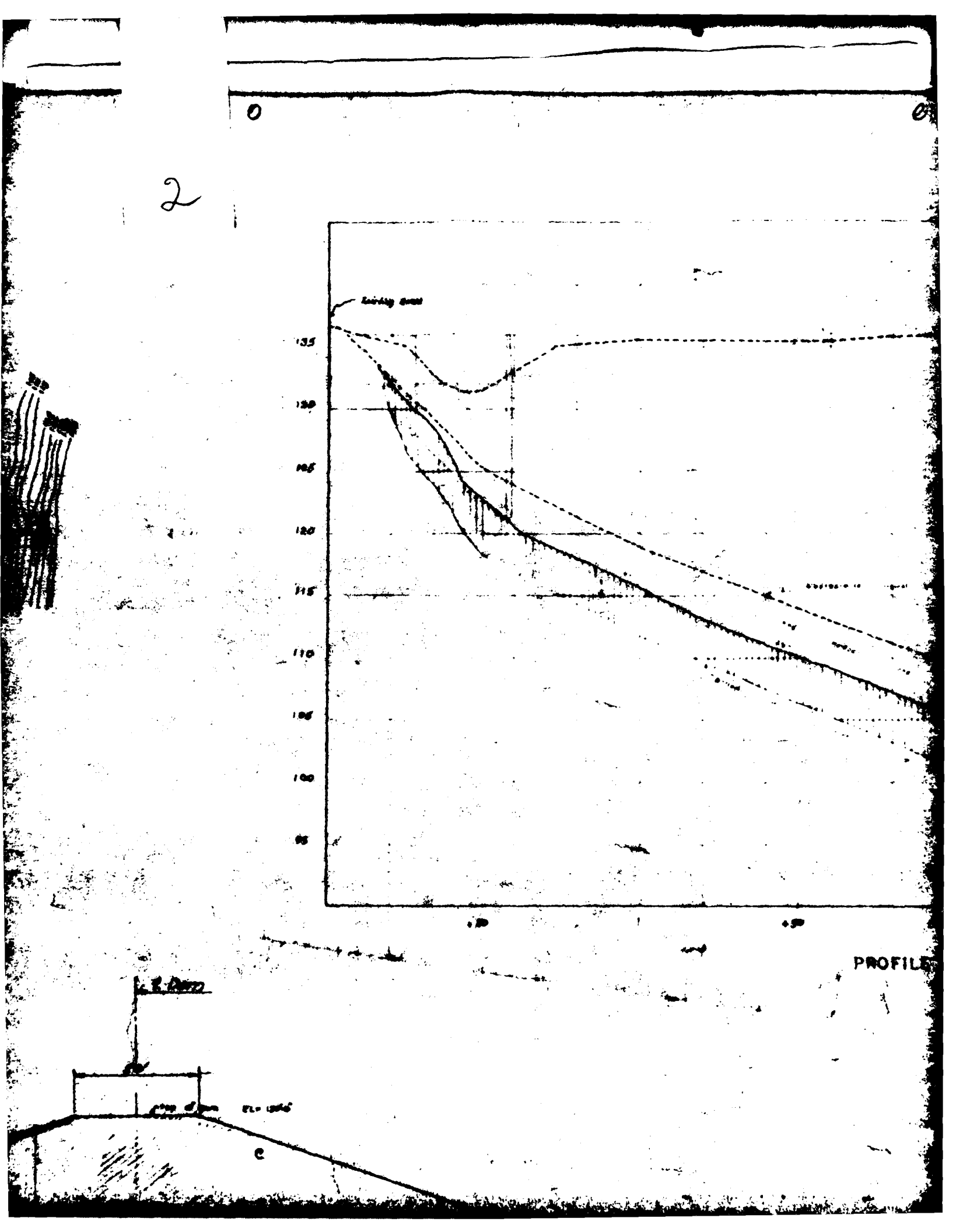
PRE-CAMBRIAN

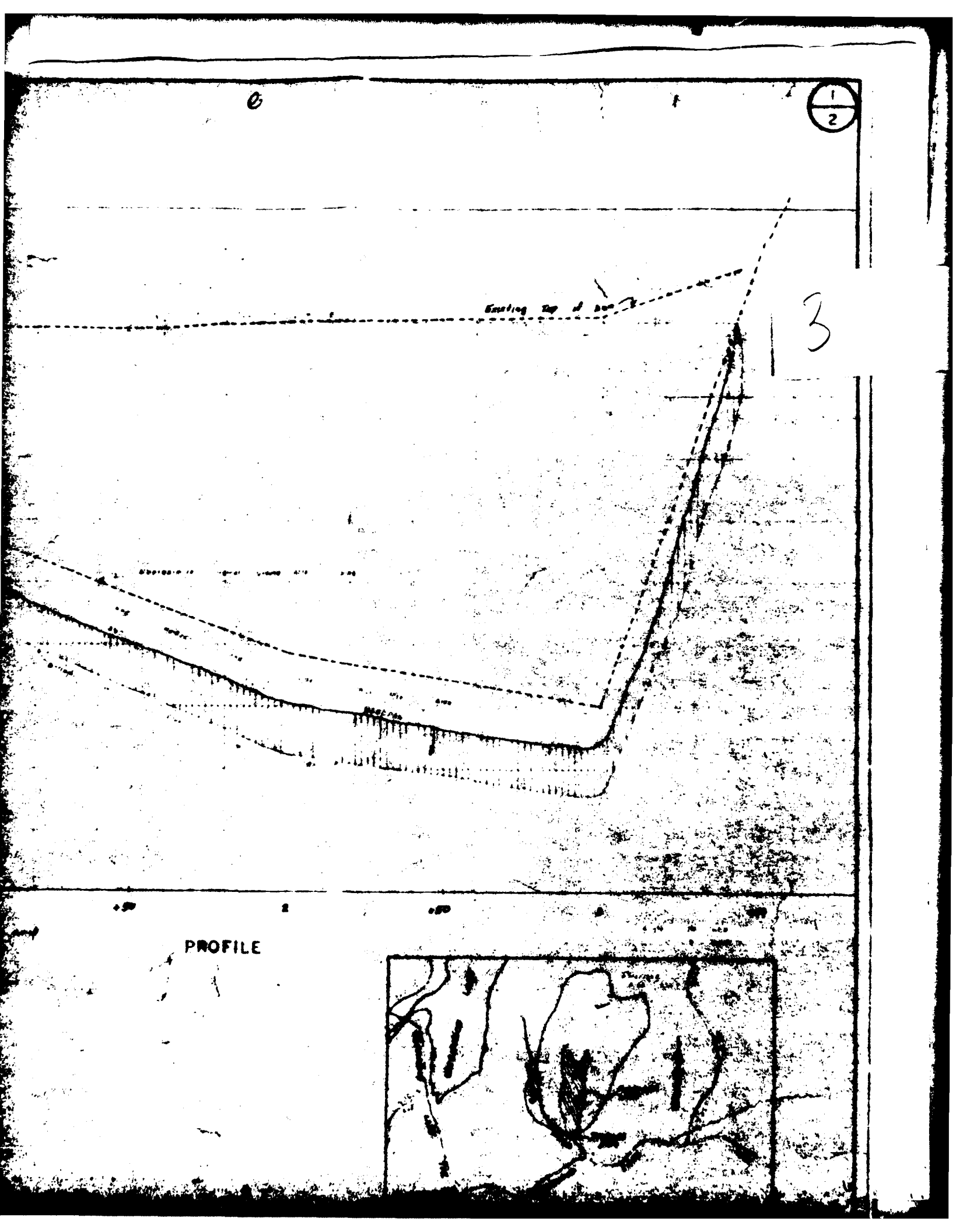
gh Hornblende Granite & Gneiss

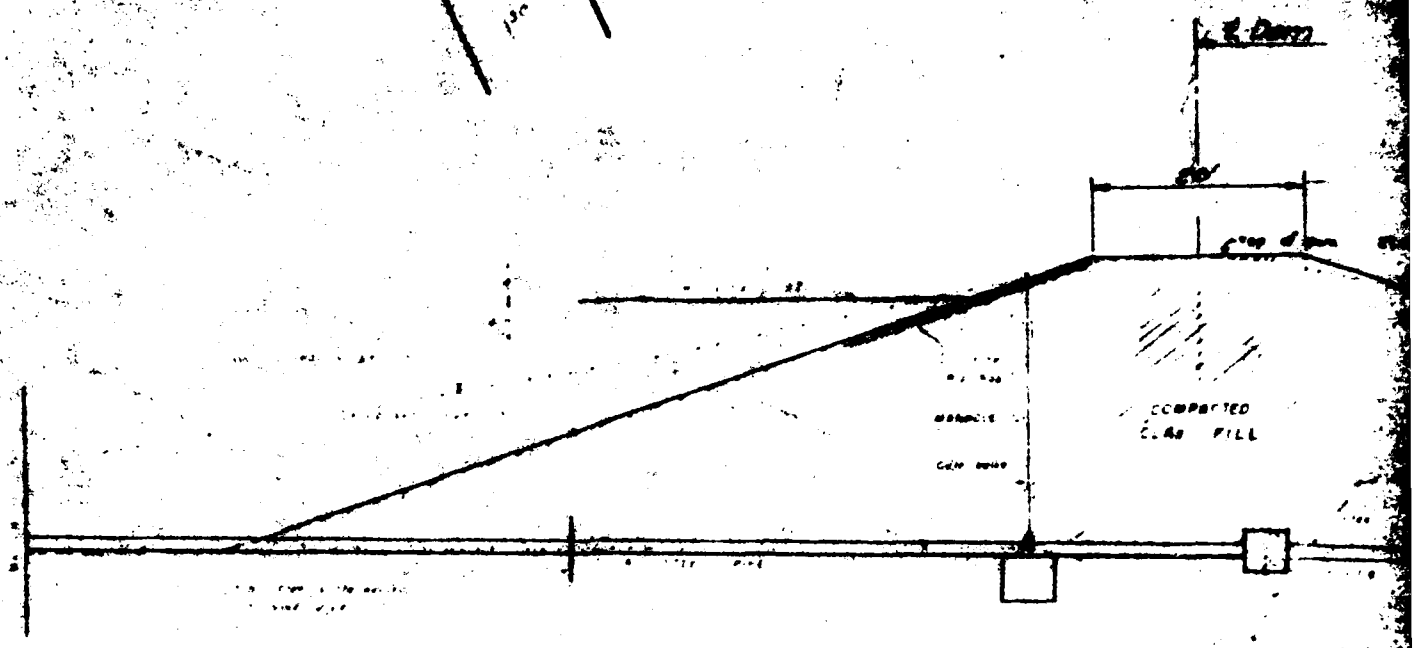
GEOLOGIC MAP
GREEN TURTLE POND DAM

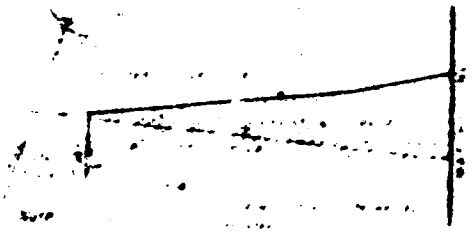
PLATE 2


PLAN


135
130
125
120
115
110
105
100
95
PROFILE


PROFILE





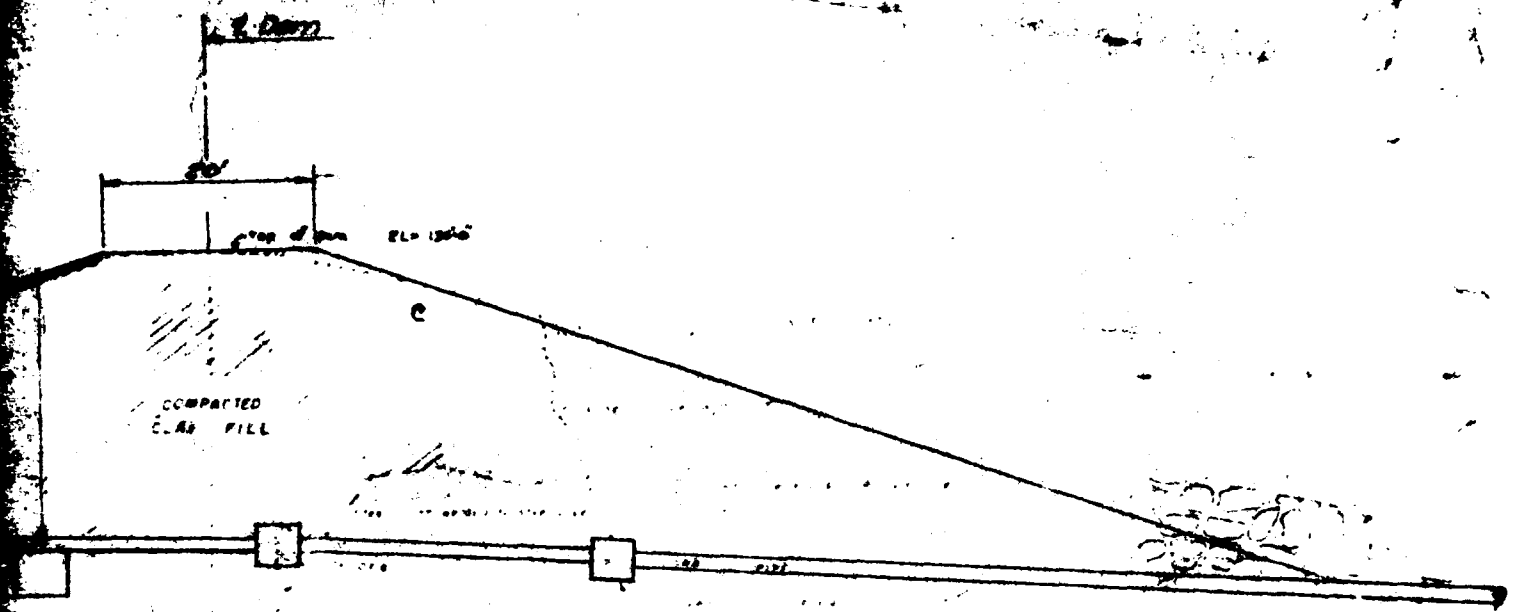
TYPICAL SECTIO

2 + 50

DETAIL

4

PROFILE



FILE

PICAL SECTION

2 + 50

STEEL PLATE DETAIL

FILE APPLICATION

5

PROFILE

LOCATION PLAN

FILE

DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY AND CONTROL

APPROVED March 20, 1957

[illegible]

DAM CLASSIFICATION No. 500

FILE DAM APPLICATION No.

PLANS OF

AWOSTING DAM SITE

(GREEN TURTLE POND DAM)
EARTH CONSTRUCTION

WEST MILFORD TWP.

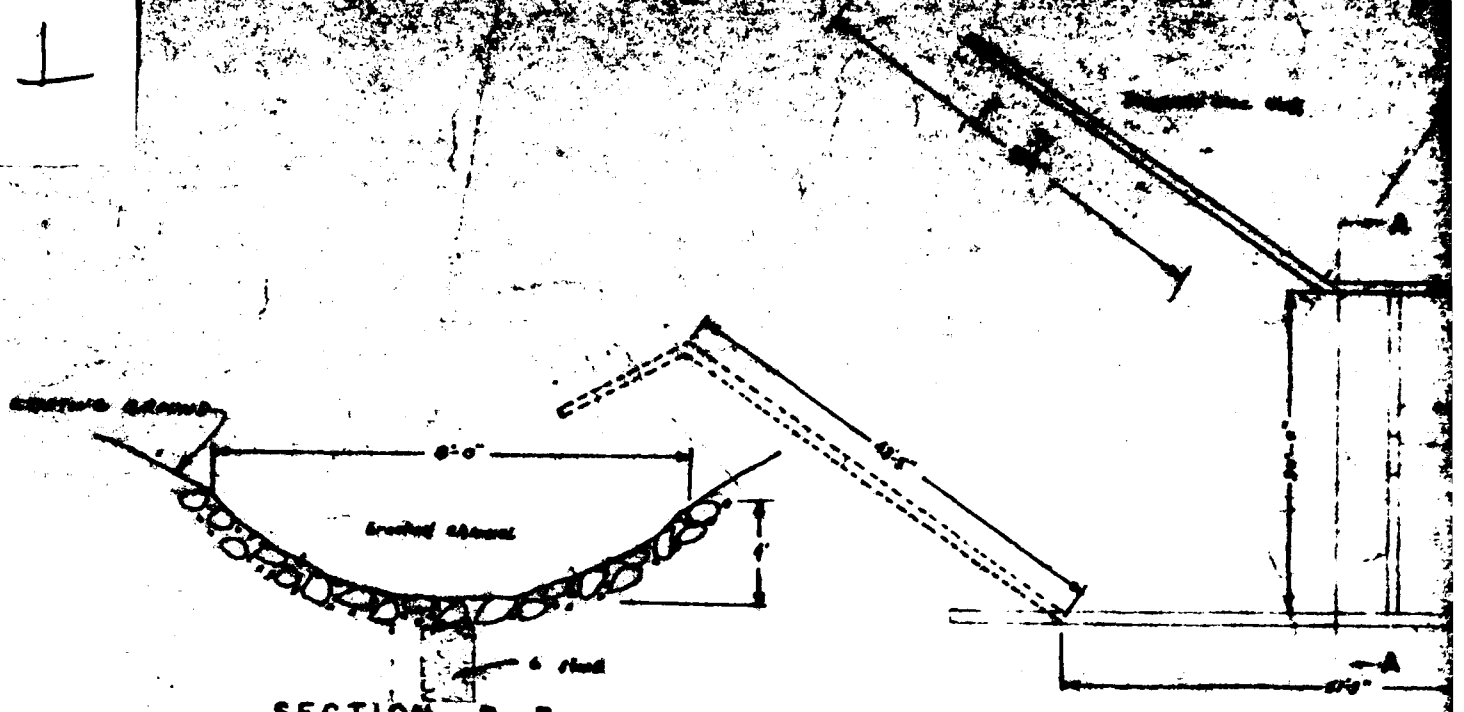
PASSAIC COUNTY — NEW JERSEY

OCTOBER 1956

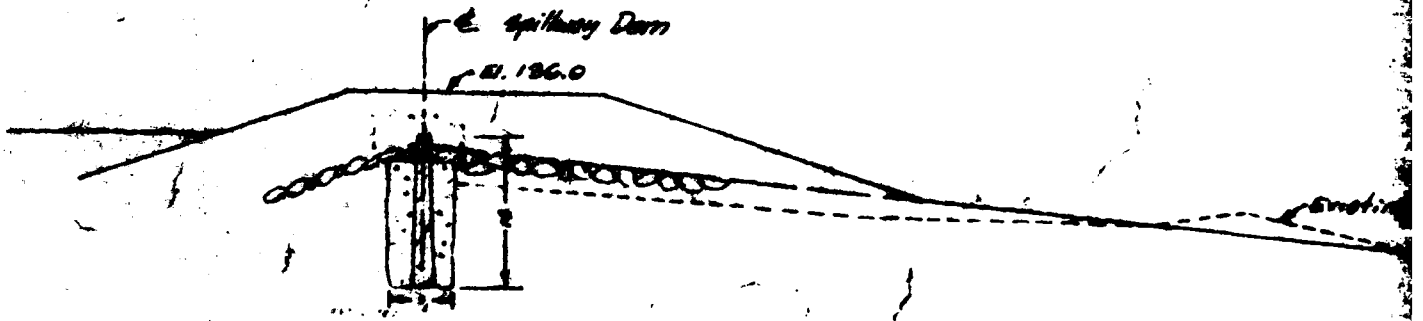
U.S.G.S. QUAD. [illegible]

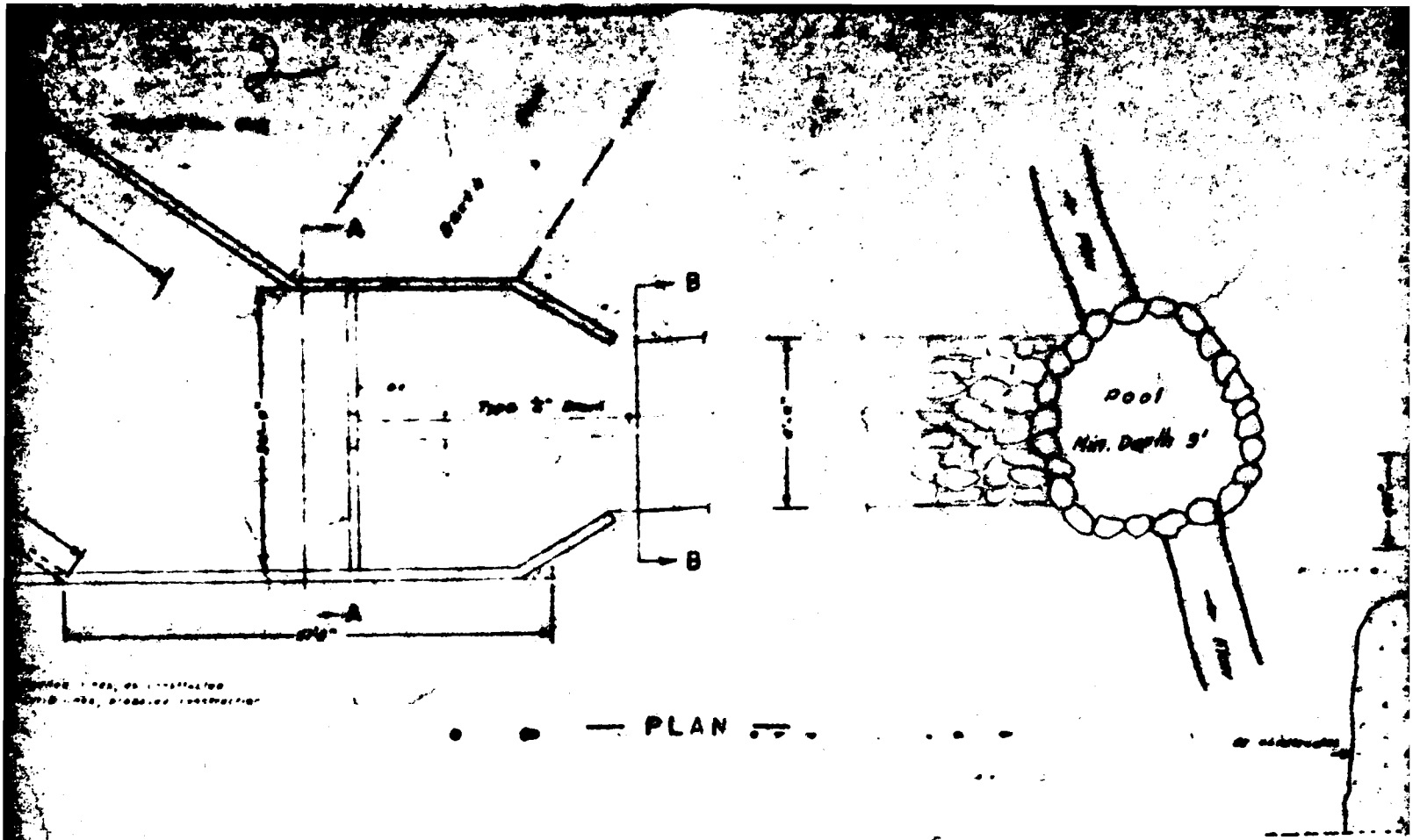
WALDO RUDE & ASSOCIATES
ENGINEERS & LAND SURVEYORS
[illegible]

PLATE 3

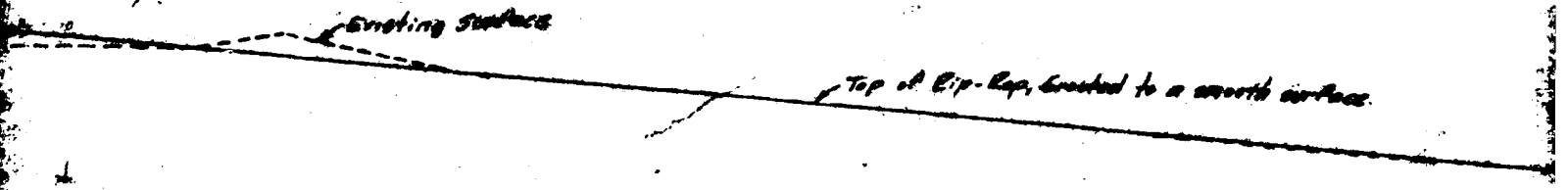


SECTION B-B

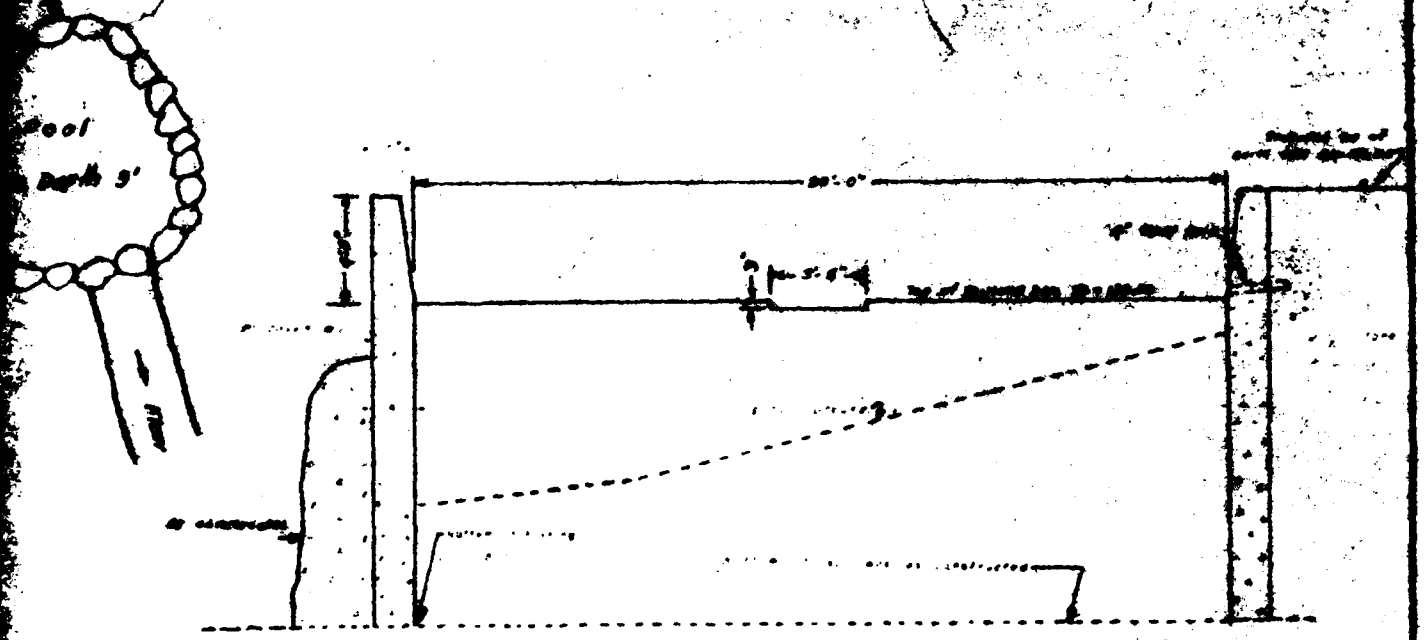




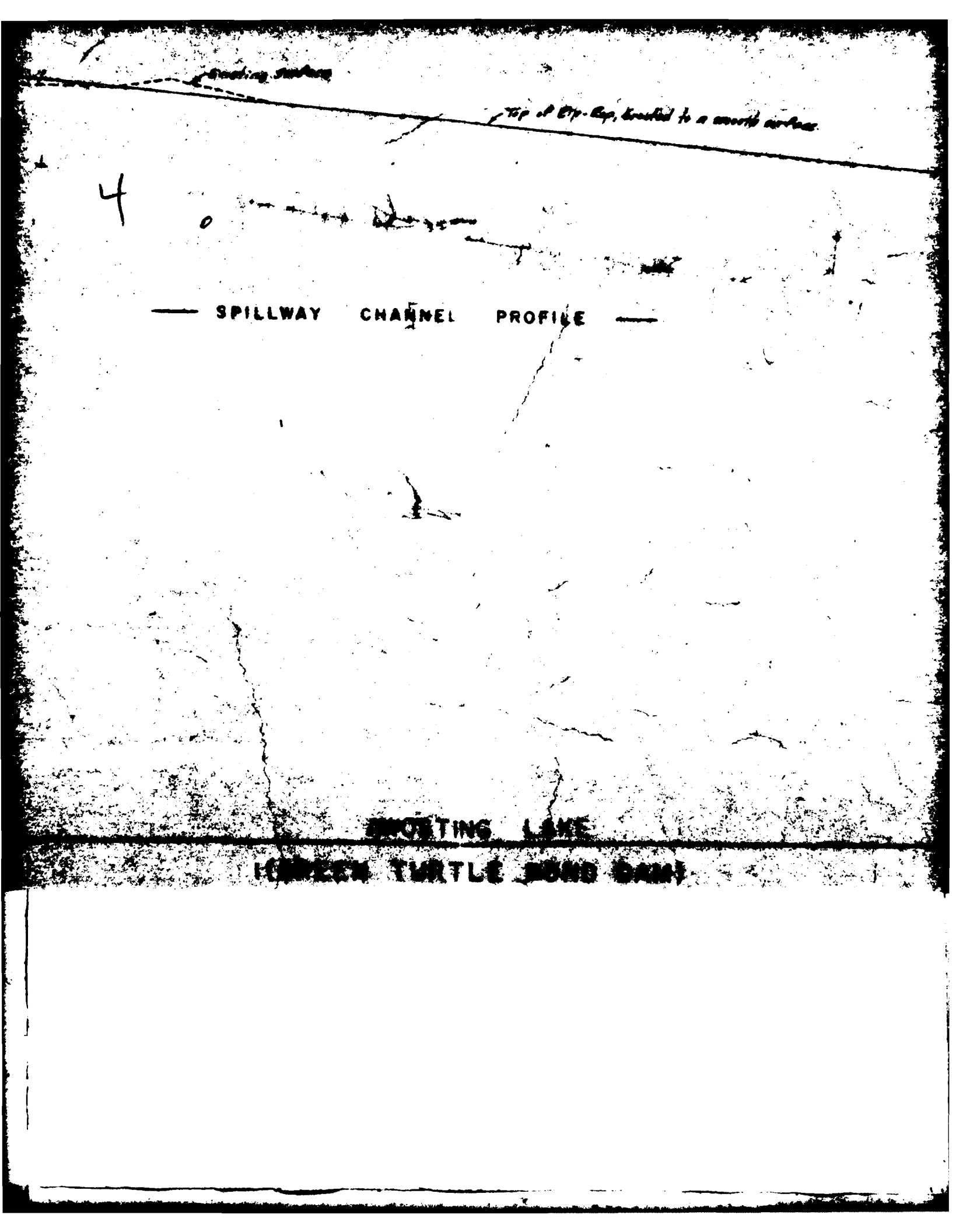
— PLAN —

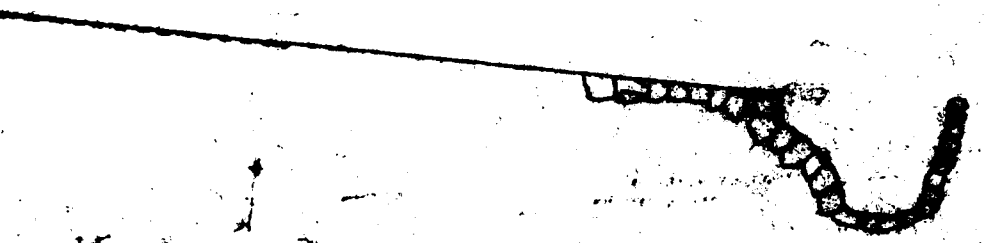


— SPILLWAY CHANNEL PROFILE —



SECTION A-A


Top of Cut-Off, trowelled to a smooth surface
4
0
— SPILLWAY CHANNEL PROFILE —
LAKE



FILE

APPENDIX A

CHECK LIST - VISUAL OBSERVATIONS

CHECK LIST - ENGINEERING, CONSTRUCTION MAINTENANCE DATA

CHECK LIST
VISUAL INSPECTION

PHASE 1

Name Dam GREEN TURTLE POND DAM County Passaic State New Jersey Coordinators NJ-DEP

Date(s) Inspection November 16, 1979 Weather Clear Temperature 34°F

Pool Elevation at Time of Inspection 576.3 NGVD Tailwater at Time of Inspection 546.0 NGVD

Inspection Personnel:

Chuck Chin
Henry King (Recorder)
Thomas Lakovich

Owner/Representative - None attended

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
SEEPAGE OR LEAKAGE N/A		
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS N/A		
DRAINS N/A		
WATER PASSAGES N/A		
FOUNDATIONS N/A		

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES N/A		
STRUCTURAL CRACKING N/A		
VERTICAL AND HORIZONTAL ALIGNMENT N/A		
MONOLITH JOINTS N/A		
CONSTRUCTION JOINTS N/A		

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
SURFACE CRACKS None noticed.		
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE None observed.		
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES None.		
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST Good.		
RIPRAP FAILURES None.		

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
EARTH EMBANKMENT	Numerous trees, small to large size, growing on both sides of earth embankment. A few trees were uprooted leaving cavities on the downstream slope.	Remove trees and fill cavities.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Good.	
ANY NOTICEABLE SEEPAGE	Minor seepage was visible at two locations: 1. Approximately 100 feet from the spillway, 5 feet left of the channel. 2. Five feet right of the low level outlet drain.	Clear all vegetation from these two areas and monitor seepage for clearness and flow quantity.
STAFF GAGE AND RECORDER	None.	
DRAINS	None.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN STILLING BASIN Could not see stilling basin because of sediment.		Clean out stilling basin.
INTAKE STRUCTURE Low level outlet drain under water in lake. Not visible.		
OUTLET STRUCTURE An 18-inch cast iron pipe was observed exiting on the downstream side of the embankment at the channel pool. Pool was filled with sediment to 3/4 level of pipe. No low level outlet gate was found on the embankment.		Clean out pool and pipe. Locate low level outlet gate and check to see if operable.
OUTLET FACILITIES None.		
EMERGENCY GATE None.		

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CONCRETE WEIR	The concrete spillway appears in good condition.	
APPROACH CHANNEL	A long concrete apron, in good condition, serves as approach channel. Trees, vegetation and silt clutter this approach.	Clean out.
DISCHARGE CHANNEL	Discharge flows over silted concrete apron and then into a grouted riprap discharge channel. The grout is cracked in some areas.	Repair cracks.
BRIDGE AND PIERS	None.	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CONCRETE SILL N/A		
APPROACH CHANNEL N/A		
DISCHARGE CHANNEL N/A		
BRIDGE AND PIERS N/A		
GATES AND OPERATION EQUIPMENT N/A		

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
MONUMENTATION/SURVEYS None.		
OBSERVATION WELLS None.		
WEIRS None.		
PIEZOMETERS None.		
OTHER None.		

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
SLOPES	Earth slopes and rock outcropping encompass the reservoir. Earth slopes are moderate and stable while rock slopes are steep and firm.	
SEDIMENTATION	None noticed.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The bottom of the downstream channel is grouted riprap. It in good condition. The grout has some cracks in it. There are some fallen trees, vegetation and debris in the channel. The channel flow runs into a pool that is located approximately 230 feet from the spillway.	Repair cracks in grout. Remove fallen trees, vegetation and debris.
SLOPES	Shallow to moderate. In good condition.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	There are three homes on the left bank, beyond Greenwood Lake Turnpike, located approximately 1,300 feet from the spillway.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	Available on microfilm at N.J. Department of Environmental Protection, (NJ-DEP), 1474 Prospect Street, P. O. Box CN-029, Trenton, NJ 08625.
REGIONAL VICINITY MAP	Available-Passaic County Map and USGS Quadrangle Sheet for Greenwood Lake, New York-New Jersey.
CONSTRUCTION HISTORY	No formal history exists, but can be deduced from available microfilm at NJ-DEP.
TYPICAL SECTIONS OF DAM	Available on microfilm at NJ-DEP.
HYDROLOGIC/HYDRAULIC DATA	Limited Hydrologic data and hydraulic data available on microfilm at NJ-DEP.
OUTLETS - PLAN	Available on microfilm (NJ-DEP)
- DETAILS	Available on microfilm (NJ-DEP)
- CONSTRAINTS	None.
- DISCHARGE RATINGS	Not available.
RAINFALL / RESERVOIR RECORDS	Not available.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
(continued)

ITEM	REMARKS
DESIGN REPORTS	None available.
GEOLOGY REPORTS	Available USGS Geologic overlay sheet for Passaic County and Engineering Soil Survey of New Jersey. Report No. 3-- Passaic County, by Rutgers University. (New Brunswick, N.J.)
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Limited hydrological and hydraulic data.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Grain size, unit weight and permeability tests of core material are available on microfilm. It is not clear if tested material was used at dam site.
POST-CONSTRUCTION SURVEYS OF DAM	None.
BORROW SOURCES	Unknown.
SPILLWAY PLAN - SECTIONS - DETAILS	Available on microfilm at NJ-DEP.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
(continued)

ITEM	REMARKS
OPERATING EQUIPMENT PLANS AND DETAILS	None available.
MONITORING SYSTEMS	None available.
MODIFICATIONS	None known to exist.
HIGH POOL RECORDS	Not kept.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None known to exist.
PRIOR ACCIDENTS OF FAILURE OF DAM - DESCRIPTION - REPORTS	None known to exist.
MAINTENANCE OPERATION RECORDS	None known to exist.

APPENDIX B

PHOTOGRAPHS

(Taken on November 16, 1979)

Photo 1 - View of earth embankment looking toward earth spillway and Awosting Road. Reservoir is out of photo to viewer's right. Note numerous trees on slopes of embankment.

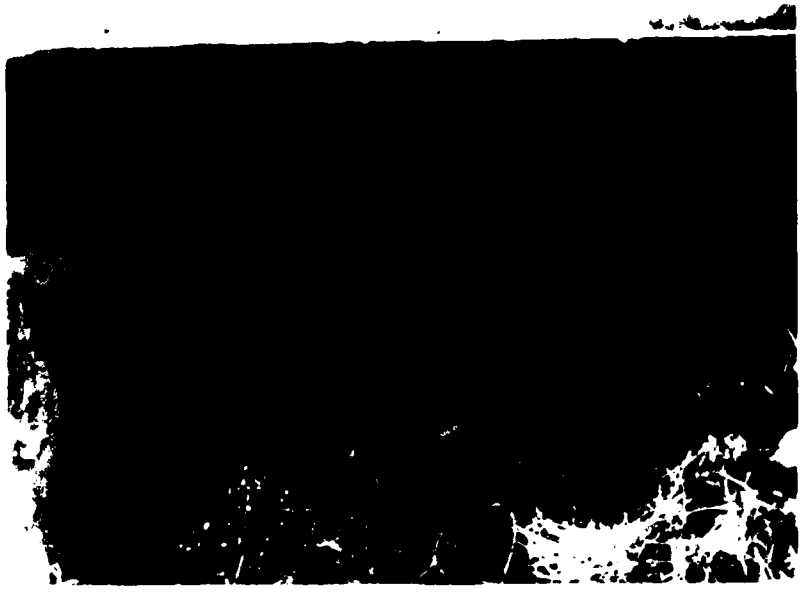


Photo 2 - Detail showing spalling in right abutment of spillway.

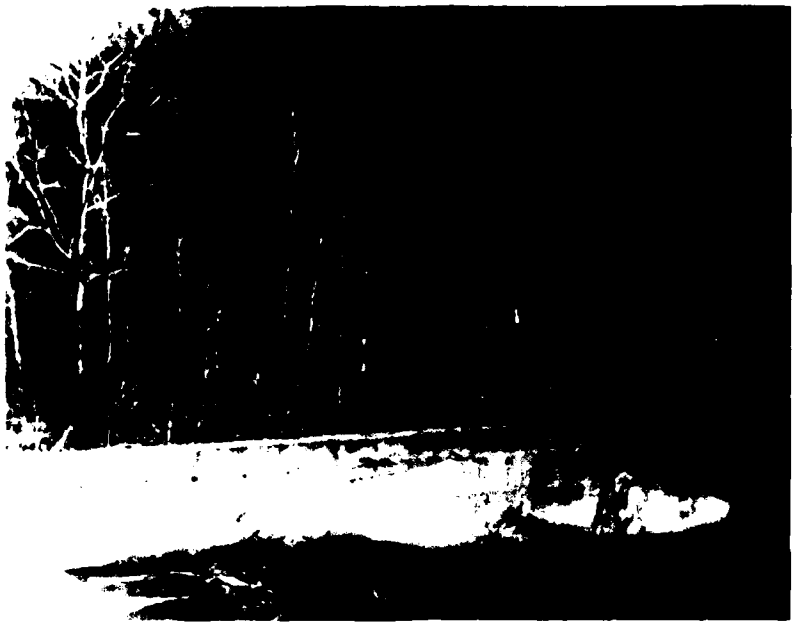


Photo 3 - View of left abutment and earth embankment. Portion of reservoir is at left. Note trees on slopes of embankment.

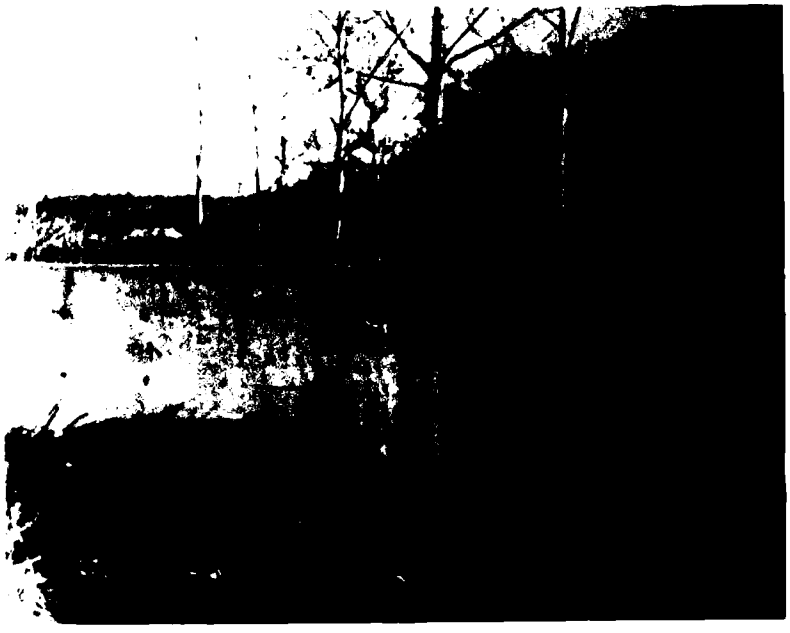


Photo 4 - Detail showing vertical crack, located at spillway, in left abutment.

Photo 5 - View of reservoir from earth embankment.
Spillway is out of photo on viewer's left.

Photo 6 - View of the approach channel to the spillway.
Portion of earth embankment is at left.

Photo 7 - View of downstream channel looking toward spillway.

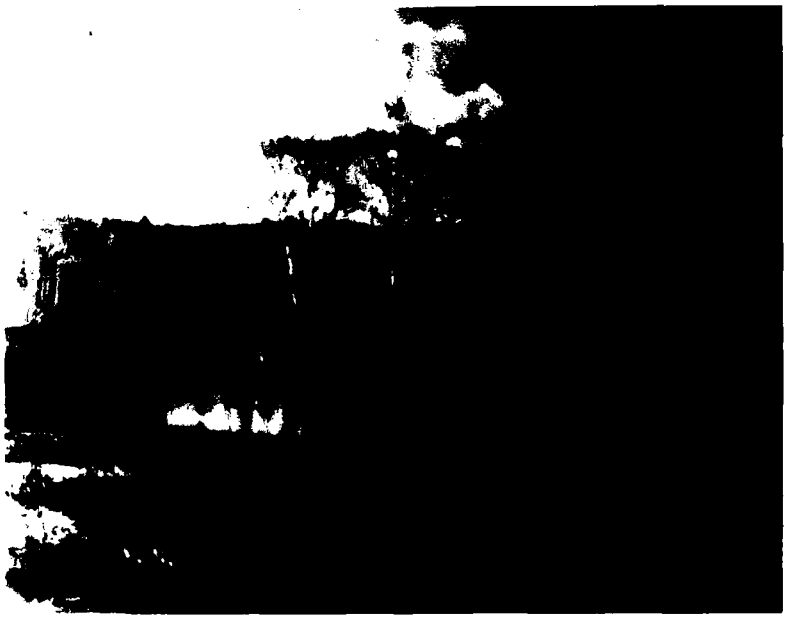


Photo 8 - View of spillway looking toward left abutment.

Photo 9 - View of downstream channel from spillway. Note vegetation and fallen trees.

Photo 10 - View of low-level outlet drain (18-inch cast iron pipe) at lower right showing sedimentation in drain.

APPENDIX C

SUMMARY OF ENGINEERING DATA

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

Name of Dam: GREEN TURTLE POND DAM

Drainage Area Characteristics: 0.5 square miles

Elevation Top Normal Pool (Storage Capacity): 576 NGVD(251 acre-feet)

Elevation Top Flood Control Pool (Storage Capacity): N/A

Elevation Maximum Design Pool: 579.76 NGVD(SDF pool: 377 acre-feet)

Elevation Top Dam: 580 NGVD(386 acre-feet)

SPILLWAY CREST:

a. Elevation 576 NGVD

b. Type Broad crest weir with concrete notch

c. Width 1 foot

d. Length 30 feet

e. Location Spillover Entire length of spillway

f. No. and Type of Gates None

OUTLET WORKS:

a. Type 18-inch C.I.P.

b. Location 400 feet left of spillway

c. Entrance Inverts 548 NGVD (estimated)

d. Exit Inverts 546 NGVD (estimated)

e. Emergency Draindown Facilities Gate valve 18-inch dia. C.I.P.

HYDROMETEOROLOGICAL GAGES:

a. Type None

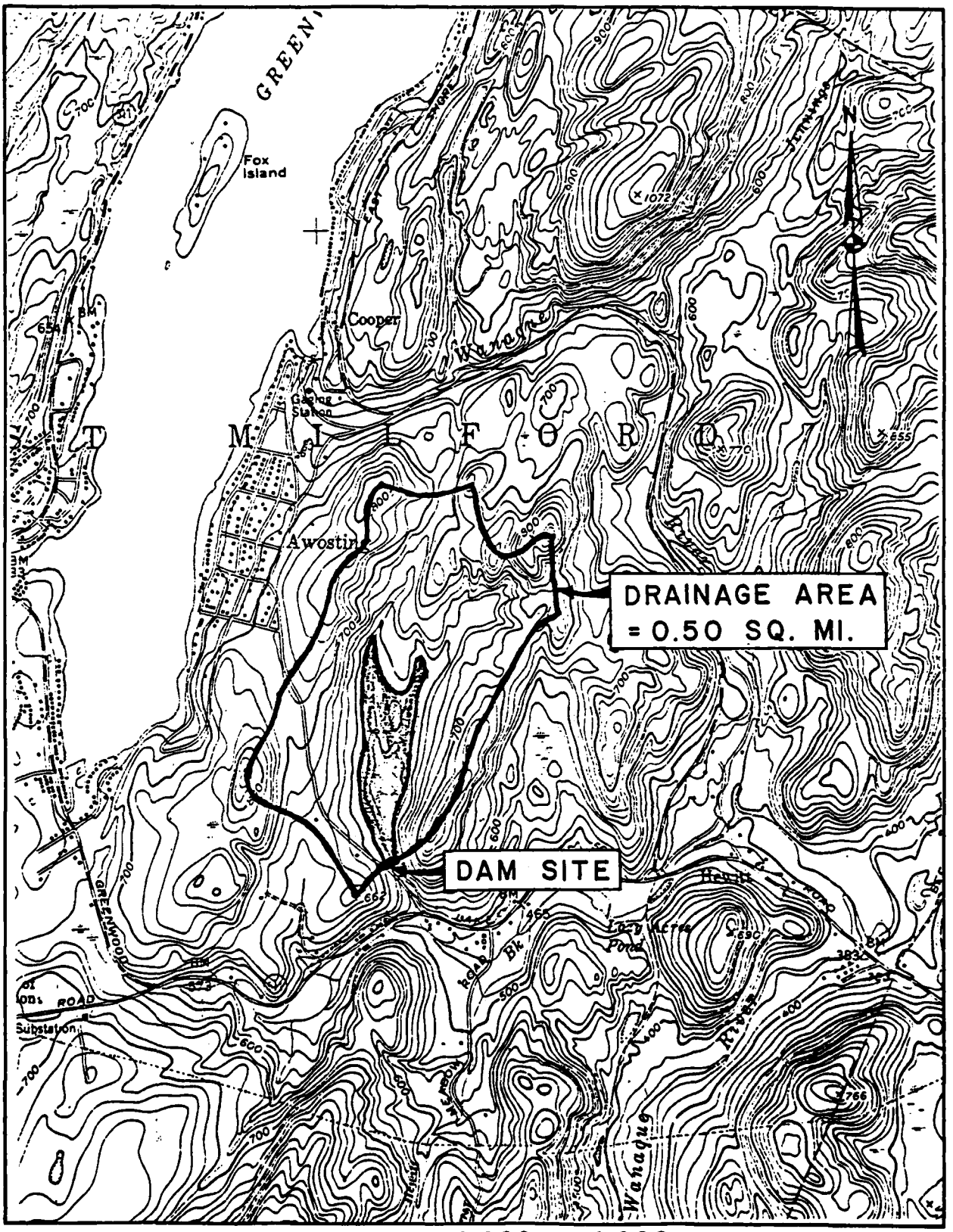
b. Location None

c. Records None

MAXIMUM NON-DAMAGING DISCHARGE: 744 cfs at elevation 580 NGVD

APPENDIX D

HYDROLOGIC COMPUTATIONS



2,000 0 2,000 4,000

Scale: 1" = 2,000 FT.

GREEN TURTLE POND DAM
DRAINAGE BASIN

GREEN TURTLE POND DAM

SIZE CLASSIFICATION

Surface area of Main impoundment	38.57 Acres
Average depth of Lake	19.52 ft
Structural Height of Dam	35 ft
Size Classification	Small

HAZARD POTENTIAL CLASSIFICATION

Heavily Travelled Roadway and Houses at D/S of Dam

Hazard Potential	High
Recommended SDF	1/2 PMF

HYDROLOGIC ANALYSIS

Flooding Routing will be computed by HEC-1 DB using SCS Triangular Unit Hydrograph with Curvilineal Transformation

D.A. = 0.50 SQ. mi.

PRECIPITATION

From Fig. 15 (Ref.: " DESIGN OF SMALL DAM ") , the Drainage Area located at the boundary between Zone 1 & Zone 6.

Probable Max. Precipitation = 25" for 6 HRS. duration & 10 mi^2.

Duration	% of PMF		
	Zone 1	Zone 6	AVG. Value
6	99	100	99.5
12	111	109	110
24	119	117	118
48	127	126	126.5

Values are reduced by 20% to account for Misalignment of basin & Storm Isohytals.

INFILTRATION DATA

Drainage Area consists of MMG only

Hydrologic Soil Group	C/D
Use initial infiltration	0.7 inch
Use Constant infiltration	0.07 in/hr.

Ref. 'Engineering Soil Survey of N.J. Report 3, Passaic County' by Rutgers University.

PRC Harris, Inc.
CONSULTING ENGINEERS

SUBJECT N.J. DAM SAFETY INSPECTION
GREEN TURTLE POND DAM
COMPUTED BY C.L.C. CHECKED BY [illegible]

SHEET No. 3 OF 6
JOB No. 10-AB3-01
DATE 1-7-80

TIME OF CONCENTRATION

1) Tc Estimated From Velocity & Water Course length

	Slope %	Velocity (fps)	
Overland Flow	$\frac{820-680}{2200} = 6.4\%$	2.0	upper watershed Wooded Land

$$t_c = \left(\frac{2200}{2.0}\right) / 3600 = 0.31 \text{ hr}$$

2) From Nomograph "Design of Small Dam" (p. 71)

$\Delta L = 820 - 680 = 140'$

$L = 2200$ $\quad s = 140/2200 = 6.4\%$

$t_c = 0.13$ Hr.

3) Using FAA Formula For Surface Flow (Airport Drainage)

$$T_c = \frac{1.8(1.1-C)\sqrt{D}}{\sqrt[3]{S}} = \frac{1.8(.8)\sqrt{2200}}{\sqrt[3]{6.4}\,(60)} = 0.61 \text{ Hr.}$$

Use $T_c = 0.35$ HRS.

LAG $= 0.6 \times 0.35 = 0.21$ HRS.

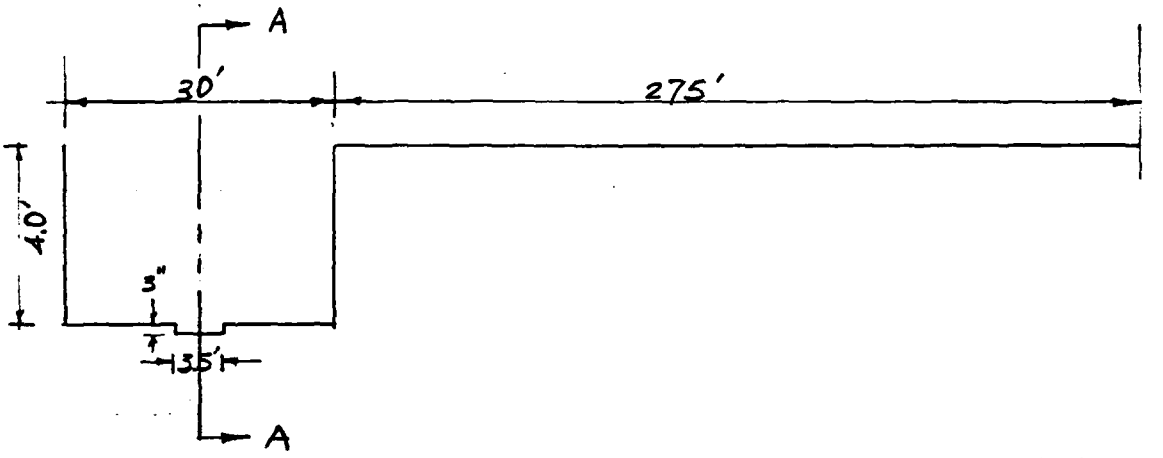
ELEVATION - AREA - CAPACITY RELATIONSHIP

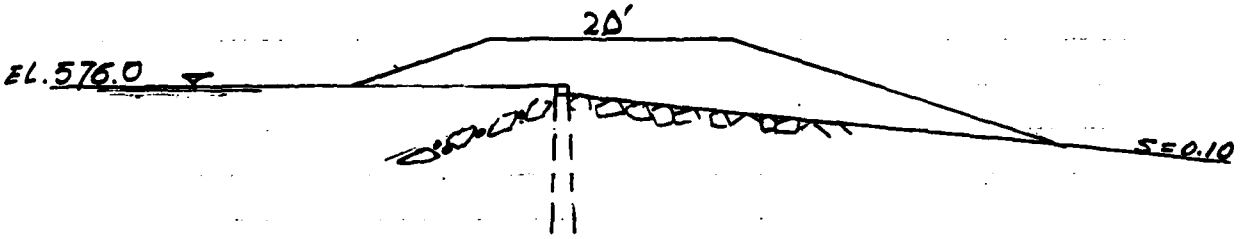
Information Obtained From U.S.G.S. Map

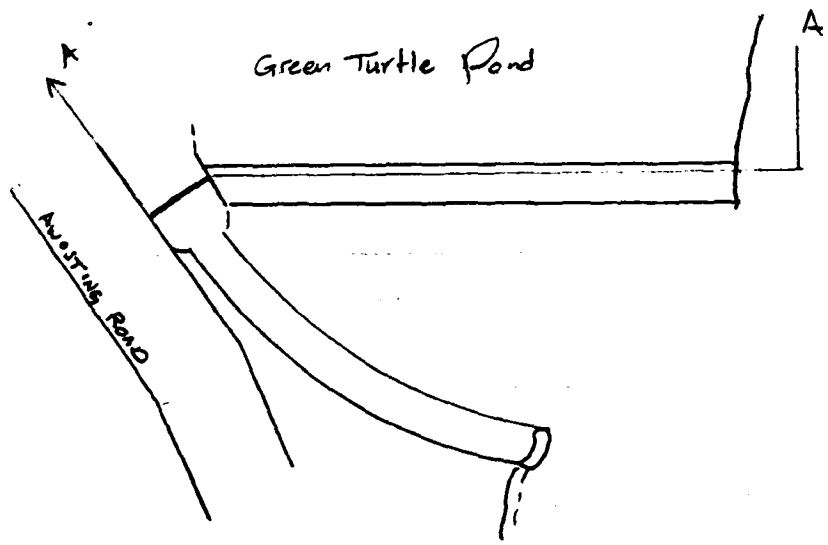
Ele.	550 *	580	600	620	640
Surface Area (Ac)	0	38.6	58.8	90.0	100.40

* Estimated bottom elevation of Lake at Spillway

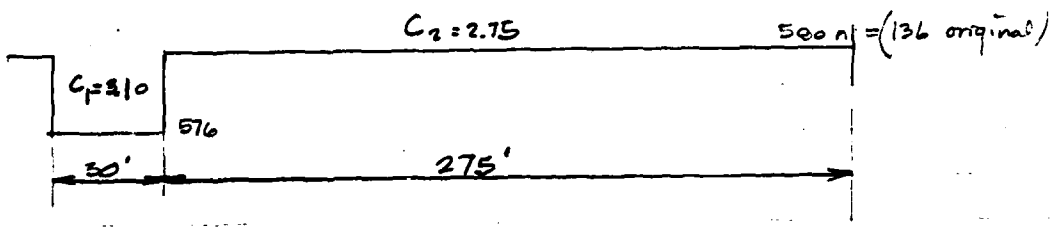
HEC-1 DB PROGRAM will develope storage capacity from surface area and elevation.







PLAN



SECTION A-A

Ave. $C_1 = 3.1$ Assume Broad Crest Weir with Breadth = 1'

Ref. table 5-3 King & Brater

Ave. $C_2 = 2.75$ losses due to roughness on the top of Dam

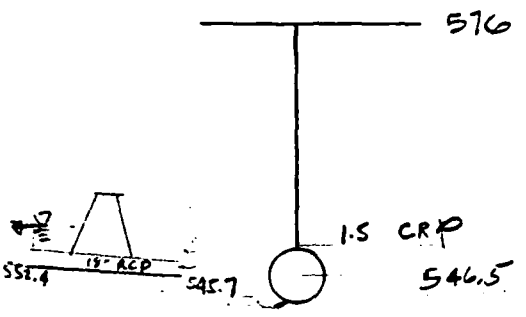
Ref. HEC-2 User manual

PRC Harris, Inc.
CONSULTING ENGINEERS

SUBJECT NJ Dam Safety Insp
Green Turtle Pond
COMPUTED BY EK CHECKED BY G.L.C.

SHEET NO. 6 OF 6
JOB NO. 10-A83-01
DATE 1/16/84

Drawdown Time Computation



Normal elevation to start drawing
@ 576
D.A = 0.5 sq mi
Inflow = 2 cfs/sq mi = 1.0 cfs
Use Fig. B-8 for CRP discharge

Res. Ele	Area acre	Ave area AC	Vol A-C	Av Res El D	h/D Av outlet Q = 6.93√h Q	t_1 hrs time of Drawdown Vol x 24 / 1.97 Q	cul time hr	time to drawdown 2.0 cfs t_1/Q_1	Cul time to hrs
576	29.0								
		23.0	138.3	573	13.7 / 40.0	41.9	41.9	1.1	93.0
570	17.1								
		13.35	66.75	567.5	10.0 / 34.0	23.8	65.7	0.7	67.5
565	9.6								
		6.95	34.75	562.5	6.7 / 28.0	15.0	80.7	0.5	83.0
560	4.3								
		2.68	13.4	557.5	3.9 / 17.0	9.6	90.3	0.6	93.2
555	1.05								
		0.65	1.69	553.7	0.87 / 5.0	4.1	94.4	98	98.1
552.4	0.25								

A) Time of complete drawdown with no inflow = 94.9 hrs ≅ 4 days

B) Time of complete drawdown with inflow = 98.1 hrs = 4 days

($A_1 \cong \frac{A_2}{\left(\frac{h}{H_T}+1^2\right)}$ $h+H_T = 30'$ $A_2 = 38.6$ Ac. between 580 to 550 NGVD

```
A1                N J DAM SAFETY INSPECTION PROGRAM---GROUP XVII  10AB301
A2                N J 00190 GREEN TUTRLE POND, PASSAIC COUNTY, NJ
A3                MULT RATIO ROUTING,PRC-HARRIS INC., WOODBRIDGE, N J
B     300         0       6                                     0       0       4
B1      5
J       1         5       1
J1     .5        .4      .3       .2      .1
K       0    LAKE                          0       0       1
K1                INFLOW HYDROGRAPH THROUHG GREEN TUTRLE POND
M       1         2     .50                .50     0.8                     1
P                25    99.5      110      118
T                                                          0.7    0.07
W2              0.21
X      -1        -.05       2
K       1        DAM                           0       0       1
K1                ROUTING DISCHARGE THROUGH DAM
Y                                       1       1
Y1      1                                                -576.0       0
$A      0      38.6    58.8     90.0    100.4
$E    550       580     600      620     640
$$ 576.0        30     3.1      1.5
$D    580     2.75     1.5      275
K      99
A
A
A
A
A
*
```

N J DAM SAFETY INSPECTION PROGRAM---GROUP XVII 10A8301
N J 00190 GREEN TUTRLE POND, PASSAIC COUNTY, NJ
MULT RATIO ROUTING,PRC-HARRIS INC., WOODBRIDGE, N J

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	6	0	0	0	0	0	4	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 5 LRTIO= 1
RTIOS= .50 .40 .30 .20 .10

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH THROUHG GREEN TUTRLE POND

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
LAKE	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.50	0.00	.50	.80	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	25.00	99.50	110.00	118.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	.70	.07	0.00	0.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= .21

RECESSION DATA
STRTQ= -1.00 QRCSN= -.05 RTIOR= 2.00

********** ********** ********** ********** **********

UNIT HYDROGRAPH 12 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= .21 VOL= 1.00

271. 833. 891. 590. 296. 162. 87. 46. 25. 13.
8. 4.

PMF

0 MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	END-OF-PERIOD FLOW COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.06	1	.01	0.00	.01	0.	1.01	15.06	151	.30	.30	.01	941.
1.01	.12	2	.01	0.00	.01	0.	1.01	15.12	152	.38	.37	.01	965.
1.01	.18	3	.01	0.00	.01	0.	1.01	15.18	153	.45	.45	.01	1052.
1.01	.24	4	.01	0.00	.01	0.	1.01	15.24	154	.60	.60	.01	1226.
1.01	.30	5	.01	0.00	.01	0.	1.01	15.30	155	1.36	1.35	.01	1670.
1.01	.36	6	.01	0.00	.01	0.	1.01	15.36	156	2.42	2.41	.01	2790.
1.01	.42	7	.01	0.00	.01	0.	1.01	15.42	157	.76	.75	.01	4019.
1.01	.48	8	.01	0.00	.01	0.	1.01	15.48	158	.60	.60	.01	4044.
1.01	.54	9	.01	0.00	.01	0.	1.01	15.54	159	.38	.37	.01	3257.
1.01	1.00	10	.01	0.00	.01	0.	1.01	16.00	160	.30	.30	.01	2387.
1.01	1.06	11	.01	0.00	.01	0.	1.01	16.06	161	.28	.27	.01	1781.
1.01	1.12	12	.01	0.00	.01	0.	1.01	16.12	162	.28	.27	.01	1376.
1.01	1.18	13	.01	0.00	.01	0.	1.01	16.18	163	.28	.27	.01	1145.
1.01	1.24	14	.01	0.00	.01	0.	1.01	16.24	164	.28	.27	.01	1019.
1.01	1.30	15	.01	0.00	.01	0.	1.01	16.30	165	.28	.27	.01	953.
1.01	1.36	16	.01	0.00	.01	0.	1.01	16.36	166	.28	.27	.01	917.
1.01	1.42	17	.01	0.00	.01	0.	1.01	16.42	167	.28	.27	.01	895.
1.01	1.48	18	.01	0.00	.01	0.	1.01	16.48	168	.28	.27	.01	882.
1.01	1.54	19	.01	0.00	.01	0.	1.01	16.54	169	.28	.27	.01	878.
1.01	2.00	20	.01	0.00	.01	0.	1.01	17.00	170	.28	.27	.01	876.
1.01	2.06	21	.01	0.00	.01	0.	1.01	17.06	171	.22	.21	.01	860.
1.01	2.12	22	.01	0.00	.01	0.	1.01	17.12	172	.22	.21	.01	810.
1.01	2.18	23	.01	0.00	.01	0.	1.01	17.18	173	.22	.21	.01	757.
1.01	2.24	24	.01	0.00	.01	0.	1.01	17.24	174	.22	.21	.01	722.
1.01	2.30	25	.01	0.00	.01	0.	1.01	17.30	175	.22	.21	.01	704.
1.01	2.36	26	.01	0.00	.01	0.	1.01	17.36	176	.22	.21	.01	694.
1.01	2.42	27	.01	0.00	.01	0.	1.01	17.42	177	.22	.21	.01	689.
1.01	2.48	28	.01	0.00	.01	0.	1.01	17.48	178	.22	.21	.01	686.
1.01	2.54	29	.01	0.00	.01	0.	1.01	17.54	179	.22	.21	.01	685.
1.01	3.00	30	.01	0.00	.01	0.	1.01	18.00	180	.22	.21	.01	684.
1.01	3.06	31	.01	0.00	.01	0.	1.01	18.06	181	.02	.01	.01	629.
1.01	3.12	32	.01	0.00	.01	0.	1.01	18.12	182	.02	.01	.01	459.
1.01	3.18	33	.01	0.00	.01	0.	1.01	18.18	183	.02	.01	.01	279.
1.01	3.24	34	.01	0.00	.01	0.	1.01	18.24	184	.02	.01	.01	197.
1.01	3.30	35	.01	0.00	.01	0.	1.01	18.30	185	.02	.01	.01	184.
1.01	3.36	36	.01	0.00	.01	0.	1.01	18.36	186	.02	.01	.01	172.
1.01	3.42	37	.01	0.00	.01	0.	1.01	18.42	187	.02	.01	.01	160.
1.01	3.48	38	.01	0.00	.01	0.	1.01	18.48	188	.02	.01	.01	150.
1.01	3.54	39	.01	0.00	.01	0.	1.01	18.54	189	.02	.01	.01	140.
1.01	4.00	40	.01	0.00	.01	0.	1.01	19.00	190	.02	.01	.01	130.
1.01	4.06	41	.01	0.00	.01	0.	1.01	19.06	191	.02	.01	.01	121.
1.01	4.12	42	.01	0.00	.01	0.	1.01	19.12	192	.02	.01	.01	113
1.01	4.18	43	.01	0.00	.01	0.	1.01	19.18	193	.02	.01	.01	106.
1.01	4.24	44	.01	0.00	.01	0.	1.01	19.24	194	.02	.01	.01	99.
1.01	4.30	45	.01	0.00	.01	0.	1.01	19.30	195	.02	.01	.01	92.
1.01	4.36	46	.01	0.00	.01	0.	1.01	19.36	196	.02	.01	.01	86.
1.01	4.42	47	.01	0.00	.01	0.	1.01	19.42	197	.02	.01	.01	80.
1.01	4.48	48	.01	0.00	.01	0.	1.01	19.48	198	.02	.01	.01	75.
1.01	4.54	49	.01	0.00	.01	0.	1.01	19.54	199	.02	.01	.01	70.
1.01	5.00	50	.01	0.00	.01	0.	1.01	20.00	200	.02	.01	.01	65.

1.01	5.06	51	.01	0.00	.01	0.
1.01	5.12	52	.01	0.00	.01	0.
1.01	5.18	53	.01	0.00	.01	0.
1.01	5.24	54	.01	0.00	.01	0.
1.01	5.30	55	.01	0.00	.01	0.
1.01	5.36	56	.01	0.00	.01	0.
1.01	5.42	57	.01	0.00	.01	0.
1.01	5.48	58	.01	0.00	.01	0.
1.01	5.54	59	.01	0.00	.01	0.
1.01	6.00	60	.01	0.00	.01	0.
1.01	6.06	61	.04	0.00	.04	0.
1.01	6.12	62	.04	.01	.03	2.
1.01	6.18	63	.04	.03	.01	14.
1.01	6.24	64	.04	.03	.01	38.
1.01	6.30	65	.04	.03	.01	61.
1.01	6.36	66	.04	.03	.01	75.
1.01	6.42	67	.04	.03	.01	82.
1.01	6.48	68	.04	.03	.01	86.
1.01	6.54	69	.04	.03	.01	88.
1.01	7.00	70	.04	.03	.01	89.
1.01	7.06	71	.04	.03	.01	90.
1.01	7.12	72	.04	.03	.01	90.
1.01	7.18	73	.04	.03	.01	90.
1.01	7.24	74	.04	.03	.01	90.
1.01	7.30	75	.04	.03	.01	90.
1.01	7.36	76	.04	.03	.01	90.
1.01	7.42	77	.04	.03	.01	90.
1.01	7.48	78	.04	.03	.01	90.
1.01	7.54	79	.04	.03	.01	90.
1.01	8.00	80	.04	.03	.01	90.
1.01	8.06	81	.04	.03	.01	90.
1.01	8.12	82	.04	.03	.01	90.
1.01	8.18	83	.04	.03	.01	90.
1.01	8.24	84	.04	.03	.01	90.
1.01	8.30	85	.04	.03	.01	90.
1.01	8.36	86	.04	.03	.01	90.
1.01	8.42	87	.04	.03	.01	90.
1.01	8.48	88	.04	.03	.01	90.
1.01	8.54	89	.04	.03	.01	90.
1.01	9.00	90	.04	.03	.01	90.
1.01	9.06	91	.04	.03	.01	90.
1.01	9.12	92	.04	.03	.01	90.
1.01	9.18	93	.04	.03	.01	90.
1.01	9.24	94	.04	.03	.01	90.
1.01	9.30	95	.04	.03	.01	90.
1.01	9.36	96	.04	.03	.01	90.
1.01	9.42	97	.04	.03	.01	90.
1.01	9.48	98	.04	.03	.01	90.
1.01	9.54	99	.04	.03	.01	90.
1.01	10.00	100	.04	.03	.01	90.
1.01	10.06	101	.04	.03	.01	90.
1.01	10.12	102	.04	.03	.01	90.
1.01	10.18	103	.04	.03	.01	90.
1.01	10.24	104	.04	.03	.01	90.
1.01	10.30	105	.04	.03	.01	90.
1.01	10.36	106	.04	.03	.01	90.
1.01	10.42	107	.04	.03	.01	90.
1.01	10.48	108	.04	.03	.01	90.
1.01	10.54	109	.04	.03	.01	90.
1.01	11.00	110	.04	.03	.01	90.

1.01	20.06	201	.02	.01	.01	61.
1.01	20.12	202	.02	.01	.01	57.
1.01	20.18	203	.02	.01	.01	53.
1.01	20.24	204	.02	.01	.01	49.
1.01	20.30	205	.02	.01	.01	46.
1.01	20.36	206	.02	.01	.01	43.
1.01	20.42	207	.02	.01	.01	40.
1.01	20.48	208	.02	.01	.01	37.
1.01	20.54	209	.02	.01	.01	35.
1.01	21.00	210	.02	.01	.01	33.
1.01	21.06	211	.02	.01	.01	30
1.01	21.12	212	.02	.01	.01	29.
1.01	21.18	213	.02	.01	.01	29.
1.01	21.24	214	.02	.01	.01	29.
1.01	21.30	215	.02	.01	.01	29.
1.01	21.36	216	.02	.01	.01	29.
1.01	21.42	217	.02	.01	.01	29
1.01	21.48	218	.02	.01	.01	29.
1.01	21.54	219	.02	.01	.01	29.
1.01	22.00	220	.02	.01	.01	29.
1.01	22.06	221	.02	.01	.01	29.
1.01	22.12	222	.02	.01	.01	29.
1.01	22.18	223	.02	.01	.01	29.
1.01	22.24	224	.02	.01	.01	29.
1.01	22.30	225	.02	.01	.01	29.
1.01	22.36	226	.02	.01	.01	29.
1.01	22.42	227	.02	.01	.01	29.
1.01	22.48	228	.02	.01	.01	29.
1.01	22.54	229	.02	.01	.01	29.
1.01	23.00	230	.02	.01	.01	29.
1.01	23.06	231	.02	.01	.01	29.
1.01	23.12	232	.02	.01	.01	29.
1.01	23.18	233	.02	.01	.01	29.
1.01	23.24	234	.02	.01	.01	29.
1.01	23.30	235	.02	.01	.01	29.
1.01	23.36	236	.02	.01	.01	29.
1.01	23.42	237	.02	.01	.01	29.
1.01	23.48	238	.02	.01	.01	29.
1.01	23.54	239	.02	.01	.01	29
1.02	0.00	240	.02	.01	.01	29.
1.02	.06	241	0.00	0.00	0.00	27.
1.02	.12	242	0.00	0.00	0.00	25.
1.02	.18	243	0.00	0.00	0.00	24.
1.02	.24	244	0.00	0.00	0.00	22.
1.02	.30	245	0.00	0.00	0.00	21.
1.02	.36	246	0.00	0.00	0.00	19.
1.02	.42	247	0.00	0.00	0.00	18.
1.02	.48	248	0.00	0.00	0.00	17.
1.02	.54	249	0.00	0.00	0.00	16.
1.02	1.00	250	0.00	0.00	0.00	15.
1.02	1.06	251	0.00	0.00	0.00	14.
1.02	1.12	252	0.00	0.00	0.00	13.
1.02	1.18	253	0.00	0.00	0.00	12.
1.02	1.24	254	0.00	0.00	0.00	11.
1.02	1.30	255	0.00	0.00	0.00	10.
1.02	1.36	256	0.00	0.00	0.00	10.
1.02	1.42	257	0.00	0.00	0.00	9.
1.02	1.48	258	0.00	0.00	0.00	8.
1.02	1.54	259	0.00	0.00	0.00	8.
1.02	2.00	260	0.00	0.00	0.00	7.

		113	04	.03	.01	90.	1.02	2.06	261	0.00	0.00	0.00	7.
		114	04	.03	.01	90.	1.02	2.12	262	0.00	0.00	0.00	6.
		115	04	.03	.01	90.	1.02	2.18	263	0.00	0.00	0.00	6.
		116	04	.03	.01	90.	1.02	2.24	264	0.00	0.00	0.00	5.
		117	04	.03	.01	90.	1.02	2.30	265	0.00	0.00	0.00	5.
		118	04	.03	.01	90.	1.02	2.36	266	0.00	0.00	0.00	5.
		119	04	.03	.01	90.	1.02	2.42	267	0.00	0.00	0.00	4.
		120	04	.03	.01	90.	1.02	2.48	268	0.00	0.00	0.00	4.
		121	.20	.19	.01	135.	1.02	3.00	269	0.00	0.00	0.00	4.
		122	.20	.19	.01	271.	1.02	3.06	270	0.00	0.00	0.00	4.
		123	.20	.19	.01	418.	1.02	3.12	271	0.00	0.00	0.00	3.
		124	.20	.19	.01	514.	1.02	3.18	272	0.00	0.00	0.00	3.
		125	.20	.19	.01	563.	1.02	3.24	273	0.00	0.00	0.00	3.
		126	.20	.19	.01	589.	1.02	3.30	274	0.00	0.00	0.00	3.
		127	.20	.19	.01	604.	1.02	3.36	275	0.00	0.00	0.00	2.
		128	.20	.19	.01	611.	1.02	3.42	276	0.00	0.00	0.00	2.
		129	.20	.19	.01	615.	1.02	3.48	277	0.00	0.00	0.00	2.
		130	.20	.19	.01	617.	1.02	3.54	278	0.00	0.00	0.00	2.
		131	.24	.23	.01	629.	1.02	4.00	279	0.00	0.00	0.00	2.
		132	.24	.23	.01	663.	1.02	4.06	280	0.00	0.00	0.00	2.
		133	.24	.23	.01	699.	1.02	4.12	281	0.00	0.00	0.00	2.
		134	.24	.23	.01	722.	1.02	4.18	282	0.00	0.00	0.00	1.
		135	.24	.23	.01	734.	1.02	4.24	283	0.00	0.00	0.00	1.
		136	.24	.23	.01	740.	1.02	4.30	284	0.00	0.00	0.00	1.
		137	.24	.23	.01	744.	1.02	4.36	285	0.00	0.00	0.00	1.
		138	.24	.23	.01	746.	1.02	4.42	286	0.00	0.00	0.00	1.
		139	.24	.23	.01	747.	1.02	4.48	287	0.00	0.00	0.00	1.
		140	.24	.23	.01	747.	1.02	4.54	288	0.00	0.00	0.00	1.
		141	.30	.29	.01	764.	1.02	5.00	289	0.00	0.00	0.00	1.
		142	.30	.29	.01	814.	1.02	5.06	290	0.00	0.00	0.00	1.
		143	.30	.29	.01	867.	1.02	5.12	291	0.00	0.00	0.00	1.
		144	.30	.29	.01	902.	1.02	5.18	292	0.00	0.00	0.00	1.
		145	.30	.29	.01	920.	1.02	5.24	293	0.00	0.00	0.00	1.
		146	.30	.29	.01	929.	1.02	5.30	294	0.00	0.00	0.00	1.
		147	.30	.29	.01	934.	1.02	5.36	295	0.00	0.00	0.00	1.
		148	.30	.29	.01	937.	1.02	5.42	296	0.00	0.00	0.00	1.
		149	.30	.29	.01	939.	1.02	5.48	297	0.00	0.00	0.00	1.
		150	.30	.29	.01	939.	1.02	5.54	298	0.00	0.00	0.00	0.
								6.00	299	0.00	0.00	0.00	0.
									300	0.00	0.00	0.00	0.
									SUM	23.60	21.65	1.95	71585.
										(599.)	(550.)	(49.)	(2027.06)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4044.	1034.	298.	239.	71600.
CMS	115.	29.	8.	7.	2027.
INCHES		19.23	22.20	22.20	22.20
MM		488.53	563.87	563.92	563.92
AC-FT		513.	592.	592.	592.
THOUS CU M		632.	730.	730.	730.

HYDROGRAPH ROUTING

ROUTING DISCHARGE THROUGH DAM

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
	DAM	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-576.	0

SURFACE AREA=	0.	39.	59.	90.	100.
CAPACITY=	0.	386.	1353.	2830.	4733.
ELEVATION=	550.	580.	600.	620.	640.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
576.0	30.0	3.1	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
580.0	2.8	1.5	275.

PEAK OUTFLOW IS 679. AT TIME 16.20 HOURS

PEAK OUTFLOW IS 525. AT TIME 16.20 HOURS

PEAK OUTFLOW IS 375. AT TIME 16.30 HOURS

PEAK OUTFLOW IS 231. AT TIME 16.30 HOURS

PEAK OUTFLOW IS 98. AT TIME 16.50 HOURS

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .50	RATIO 2 .40	RATIO 3 .30	RATIO 4 .20	RATIO 5 .10
HYDROGRAPH AT	LAKE	.50	1	2022.	1617.	1213.	809.	404.
		(1.29)	(	57.25)(	45.80)(	34.35)(	22.90)(	11.45)(
ROUTED TO	DAM	.50	1	679.	525.	375.	231.	98.
		(1.29)	(	19.22)(	14.87)(	10.62)(	6.54)(	2.78)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	576.00	576.00	580.00
STORAGE	251.	251.	386.
OUTFLOW	0.	0.	744.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	579.76	0.00	377.	679.	0.00	16.20	0.00
.40	579.17	0.00	355.	525.	0.00	16.20	0.00
.30	578.53	0.00	332.	375.	0.00	16.30	0.00
.20	577.83	0.00	308.	231.	0.00	16.30	0.00
.10	577.04	0.00	283.	98.	0.00	16.50	0.00

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FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
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DAT
FILM